DIGITAL PROJECTION

USER MANUAL

INSTALLATION AND QUICK-START GUIDE
CONNECTION GUIDE
OPERATING GUIDE
MAINTENANCE GUIDE
REFERENCE GUIDE

HIGHlite 8000 Series

High Brightness Digital Video Projector

Rev F July 2014

114-173F

About This Document

Please follow the instructions in this manual carefully to ensure safe and long-lasting use of the projector.

Keep this manual handy for future reference.

Symbols used in this manual

Many pages in this document have a dedicated area for notes. The information in that area is accompanied by the following symbols:

WARNING: this symbol indicates that there is a danger of physical injury to yourself and/or damage to the equipment unless the instructions are closely followed.

ELECTRICAL WARNING: this symbol indicates that there is a danger of electrical shock unless the instructions are closely followed.

NOTE: this symbol indicates that there is some important information that you should read.

Product revision

Because we at Digital Projection continually strive to improve our products, we may change specifications and designs, and add new features without prior notice.

Legal notice

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Notes

Introduction

Congratulations on your purchase of this Digital Projection product.

Your projector has the following key features:

- Single DVI input (HDMI compatible)
- Control of most aspects of the projector's operation via LAN and RS232
- Ceiling mount and rear-screen installation options
- Long lamp life
- Motorised lens mount

A serial number is located on the back of the projector. Please record it here:

Notes

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INSTALLATION AND QUICK-START GUIDE

HIGHlite 8000 Series

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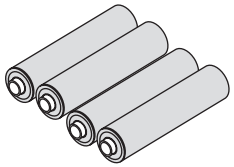
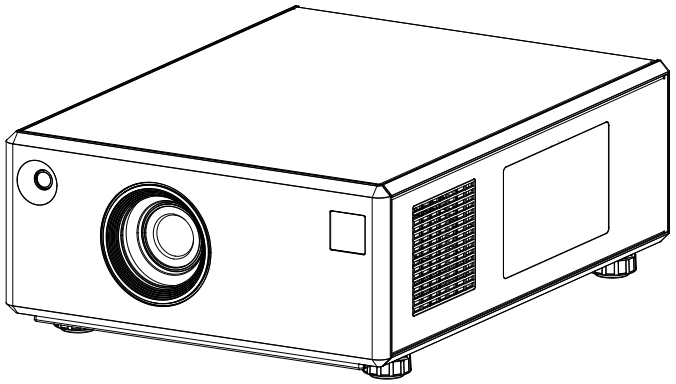
What's In The Box?

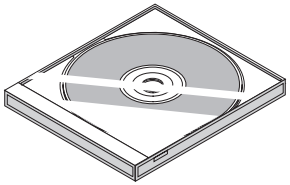
Remote control (105-023)



4x AAA batteries



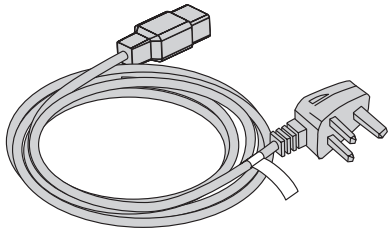
Projector



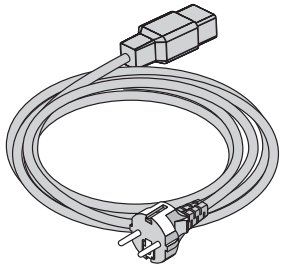
User Manual on disc (115-759)

DVI cable (111-316)

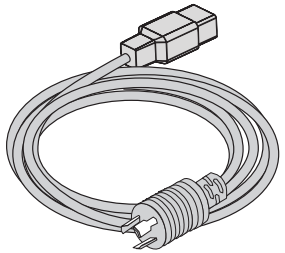
Important Information (114-174)



Power cable, United Kingdom (102-180)



Power cable, Europe (102-163)



Power cable, North America (102-165)

Notes

Make sure your box contains everything listed. If any pieces are missing, contact your dealer.

You should save the original box and packing materials, in case you ever need to ship your projector.

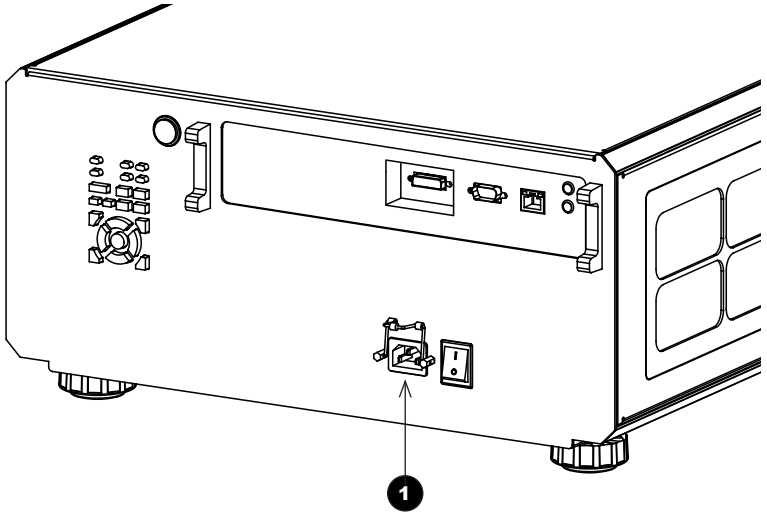
The projector is shipped without a lens.

Only one power cable - dependent on the destination territory - will be supplied with the projector.

Connecting The Power Supply

Lift the cable lock up, push the mains connector in firmly and push the lock down to secure the cable.

1 **AC mains inlet with cable lock**



Rear view of the projector

Notes

Use only the power cable provided.

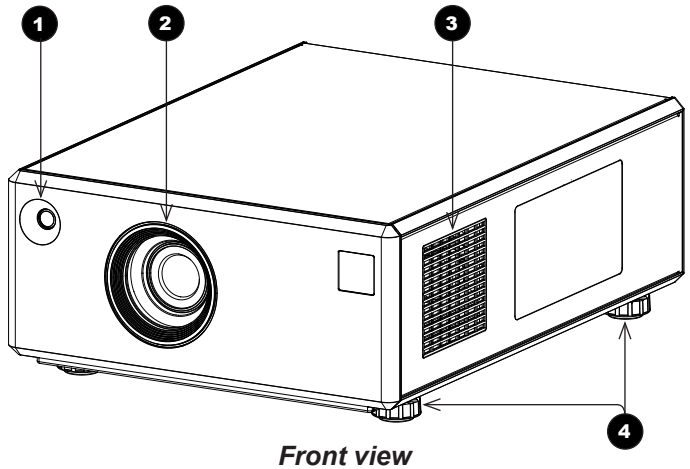
Ensure that the power outlet includes a ground connection as this equipment MUST be earthed.

Handle the power cable carefully and avoid sharp bends. Do not use a damaged power cable.

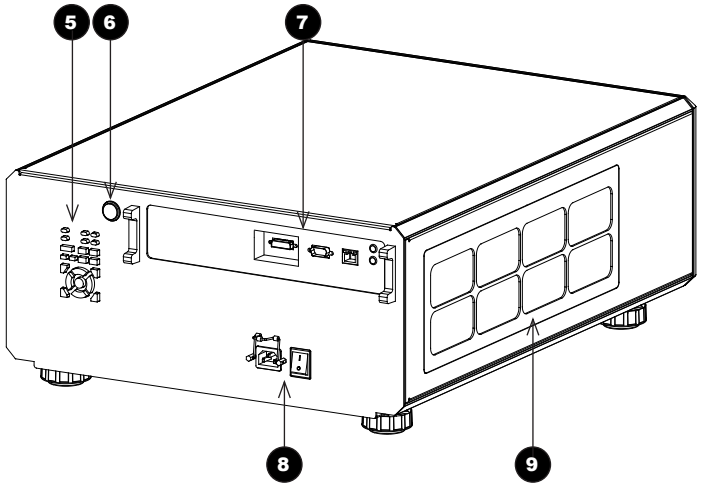
Projector Overview

Front and rear views

1. Front infrared window
2. Lens
3. Air outlet
4. Adjustable feet
5. Control panel
6. Rear infrared window
7. Connection panel
8. Power switch and power connection
9. Air inlet



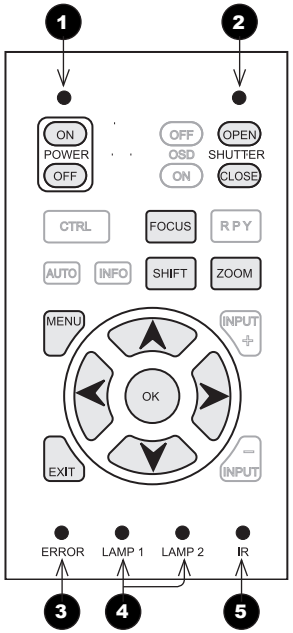
Front view



Rear view

Notes

Control panel indicators



1 Power indicator

Behavior		Meaning
Off	●	The projector is switched off.
On (amber)	●	The projector is in Standby mode.
On (green)	●	The projector is switched on (Normal mode).

2 Shutter indicator

Behavior		Meaning
On (amber)	●	The shutter is closed.
On (green)	●	The shutter is open.

3 Error indicator

Behavior		Meaning
On (red)	●	Voltage Error
Flashing	✺	Temperature Error

4 Lamp 1 and Lamp 2 indicators

Behavior		Meaning
On (green)	●	The lamp is switched on (100%).
On (amber)	●	The lamp is switched on (85-99%).
Flashing (green)	✺	The lamp is warming up.
Flashing (amber)	✺	The lamp is cooling down.
Flashing (red)	✺	Lamp Error

5 Infrared indicator

Behavior		Meaning
Flashing (blue)	✺	The projector is receiving input from the remote control.

Notes

Only the controls shown highlighted are used on this projector.

During startup all LEDs light up at the same time to indicate the projector is carrying out a self-test.

Control panel buttons are identical to buttons on the remote control. For information about button functions, see the ***Remote Control*** *section.*

Remote Control

1 **Transmit indicator**
Flashes when the remote control sends a signal to the projector.

2 **Power ON / OFF**

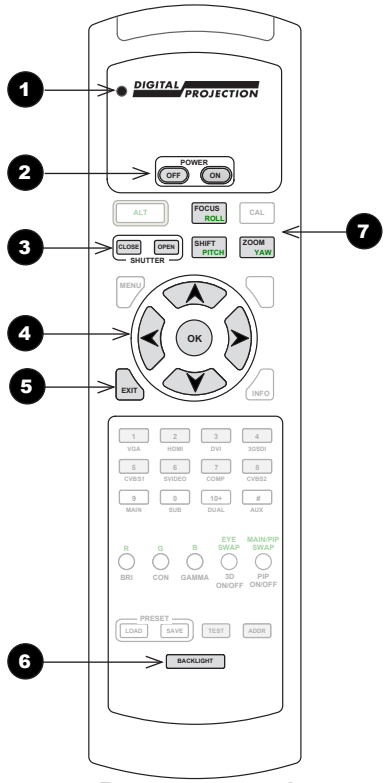
3 **Shutter OPEN / CLOSE**

4 **Arrow buttons**
Control lens movement.

5 **EXIT button**
Exits a lens control mode entered by pressing one of the lens control buttons.

6 **Remote control backlight ON / OFF**
Make the remote control buttons glow in the dark, or switch this feature off.

7 **Lens control buttons**
Use with the arrow buttons to adjust lens position, zoom and focus.

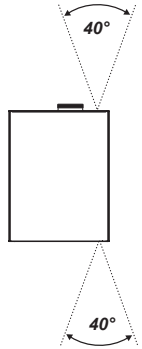


Remote control

Infrared reception

The projector has infrared sensors at the front and back.

The angle of acceptance is 40°. Make sure that the remote control is within the angle of acceptance when trying to control the projector.



Infrared reception

Notes

Only the controls shown highlighted are used on this projector.

When any of the three lens control buttons is pressed, the projector will enter LENS ADJUSTMENT mode and the blue transmit indicator on the remote control will light for 10 seconds:

When no adjustment has been made for 10 seconds, the LED will go out and the projector will exit LENS ADJUSTMENT mode. Press the lens control button again to resume adjustment.

To end the adjustment before 10 seconds has elapsed, press the **EXIT** *button.*

All other adjustments will be locked out until the lens adjustment is ended.

For more information about LENS ADJUSTMENT mode, see ***Adjusting the lens*** *further in this guide.*

Infrared reception is confirmed by the blue IR LED flashing on the control panel.

The infrared receivers are disabled when a remote control is connected via a cable. For more information, see ***Control Connections*** *in the* ***Connection Guide****.*

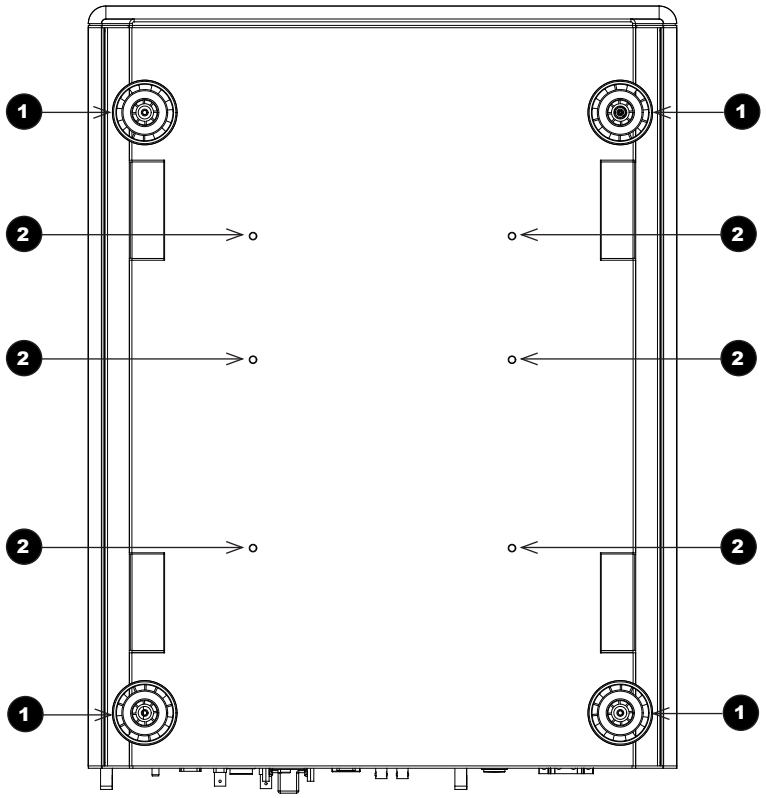
Positioning The Screen And Projector

1. Install the screen, ensuring that it is in the best position for viewing by your audience.
2. Mount the projector, ensuring that it is at a suitable distance from the screen for the image to fill the screen. Set the adjustable feet so that the projector is level, and perpendicular to the screen.

The drawing below shows the positions of the feet for table mounting, and the fixing holes for ceiling mounting.

1 **Four adjustable feet**

2 **Six M6 holes for ceiling mount**
The screws should not penetrate more than 15 mm (0.6 in.) into the body of the projector.



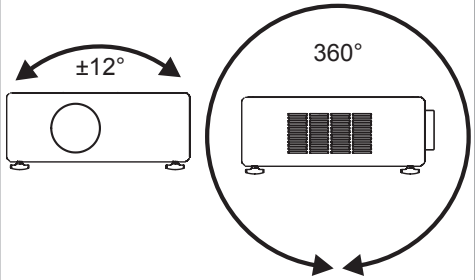
Notes

Always allow the projector to cool for five minutes before disconnecting the power or moving the projector.

Ensure that there is at least 30 cm (12 in.) of space between the ventilation outlets and any wall, and 10 cm (4 in.) on all other sides.

Do not stack more than three projectors.

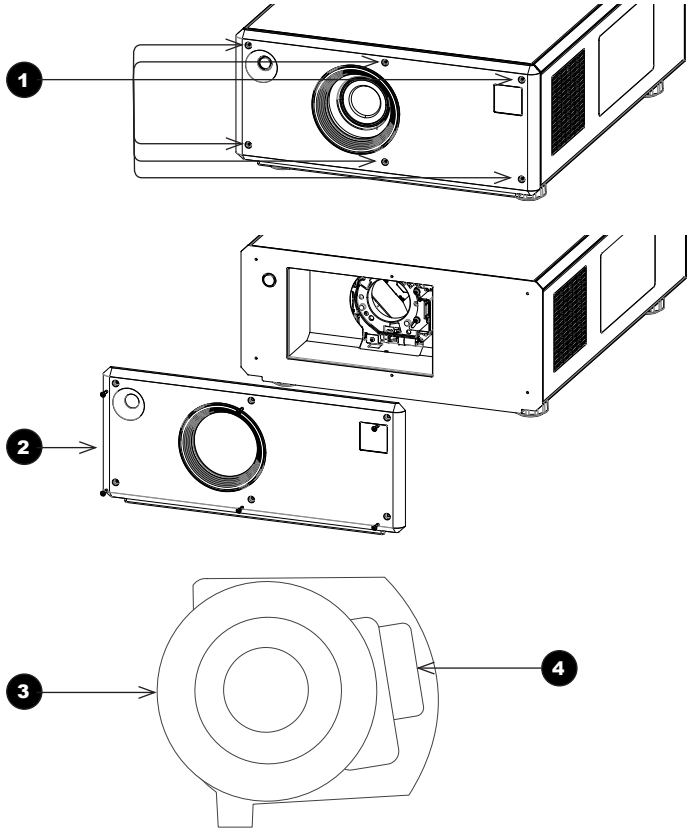
Do not tilt the projector more than ±12° from side to side when in use, as this may cause serious lamp failure, damage the lamp module and cause extra cost on replacement.



Changing The Lens

Inserting a new lens

1. Remove the six ***screws*** (1) securing the front cover to the body of the projector.
2. Remove the ***front cover*** (2) from the projector.
3. Remove the lens from its packaging and remove the two protective caps from the front and back of the lens.
4. Insert the ***lens*** (3) into the lens aperture, making sure that the plug on the zoom drive mechanism lines up with the ***socket*** (4) on the right of the lens aperture.
5. Push the lens in firmly as far as it will go.
6. Rotate the lens clockwise as far as it will go.
7. Replace the front cover and secure it with the six screws.



Notes

Before changing the lens, always make sure the projector is switched off and fully disconnected from its power supply.

Always allow the lamp to cool for five minutes before:

- disconnecting the power
- moving the projector

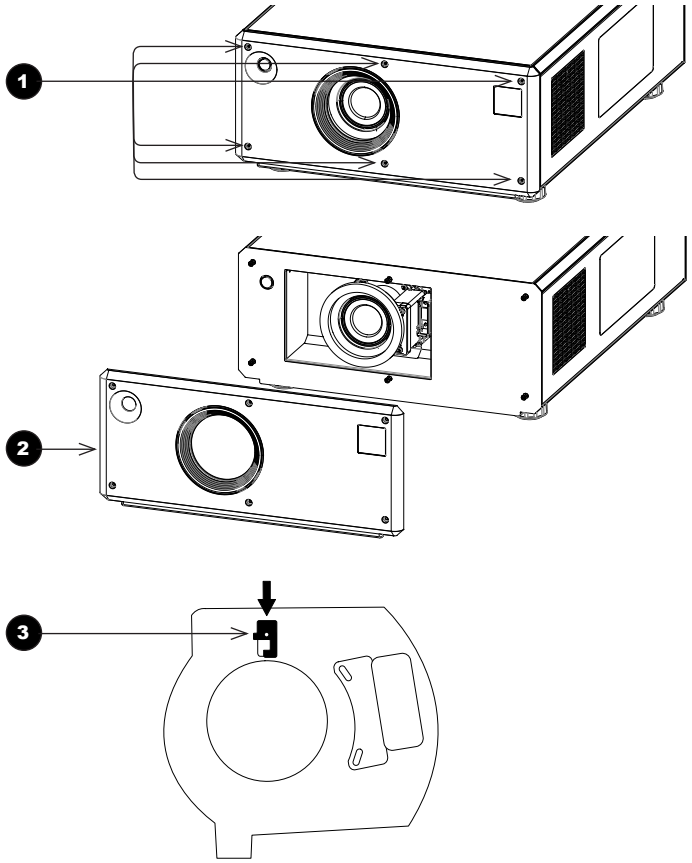
When changing the lens, avoid using excessive force as this may damage the equipment.

Avoid touching the surface of the lens as this may result in image impairment.

Take care to preserve the original lens packaging and protective caps for future use.

Removing the lens

1. Remove the six ***screws*** (1) securing the front cover to the body of the projector.
2. Remove the ***front cover*** (2) from the projector.
3. Push down the ***lens holder tab*** (3).
4. Rotate the lens anti-clockwise
5. Pull the lens forward to remove it from the lens aperture.



Notes

Before changing the lens, always make sure the projector is switched off and fully disconnected from its power supply.

Always allow the lamp to cool for five minutes before:

- disconnecting the power
- moving the projector

When changing the lens, avoid using excessive force as this may damage the equipment.

Avoid touching the surface of the lens as this may result in image impairment.

Take care to preserve the original lens packaging and protective caps for future use.

Operating The Projector

Switching the projector on

1. Connect the power cable between the mains supply and the projector. Switch on at the switch next to the power connector.
2. Wait until the self-test has completed and the standby indicator on the projector control panel shows amber. The lamp will be off and the projector will be in STANDBY mode.
3. Press **ON** on the remote control or the control panel and hold for three seconds, to switch the projector ON. The power indicator on the control panel will show green, the lamp will light and the shutter will open.

Switching the projector off

1. Press **OFF** on the remote control or the control panel, and hold for three seconds. The power indicator on the control panel will show amber, the lamp will go out and the cooling fans will run for a short time until the projector enters STANDBY mode.
2. If you need to switch the projector off completely, switch off at the mains power switch next to the power connector and then disconnect the power cable from the projector

Selecting an input signal

Connect an image source to the projector. The signal should be automatically detected by the projector, and should be displayed within two or three seconds.

Notes

The self-test is running when all the LEDs on the control panel are lit.

Always allow the lamp to cool for five minutes before:

- disconnecting the power
- moving the projector

Adjusting the lens

Focus

1. Press the **FOCUS** button on the remote control. The blue transmit LED on the remote will light, indicating that the remote control is in LENS FOCUS mode.
2. Within 10 seconds, press and hold the **UP** or **DOWN** arrow button to adjust the focus. Release the arrow button to stop the movement.
3. When the projector is in focus, press the **EXIT** button on the remote to exit LENS FOCUS mode.

Zoom

1. Press the **ZOOM** button on the remote control. The blue transmit LED on the remote will light, indicating that the remote control is in LENS ZOOM mode.
2. Within 10 seconds, press and hold the **UP** or **DOWN** arrow button to adjust the zoom. Release the arrow button to stop the movement.
3. When the zoom has been set, press the **EXIT** button on the remote to exit LENS ZOOM mode.

Shift

1. Press the **SHIFT** button on the remote control. The blue transmit LED on the remote will light, indicating that the remote control is in LENS SHIFT mode.
2. Within 10 seconds, press and hold the **UP**, **DOWN**, **LEFT** or **RIGHT** arrow button to adjust the image position. Release the arrow button to stop the movement.
3. When the position has been set, press the **EXIT** button on the remote to exit LENS SHIFT mode.

Notes

When any of the three lens control buttons is pressed, the projector will enter LENS ADJUSTMENT mode and the blue transmit indicator on the remote control will light for 10 seconds:

When no adjustment has been made for 10 seconds, the LED will go out and the projector will exit LENS ADJUSTMENT mode. Press the lens control button again to resume adjustment.

To end the adjustment before 10 seconds has elapsed, press the **EXIT** *button.*

All other adjustments will be locked out until the lens adjustment is ended.

DIGITAL PROJECTION

CONNECTION GUIDE

HIGHlite 8000 Series

High Brightness Digital Video Projector

Rev F July 2014

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Inputs And Outputs

Signal input: DVI/HDMI

1 **DVI-D**

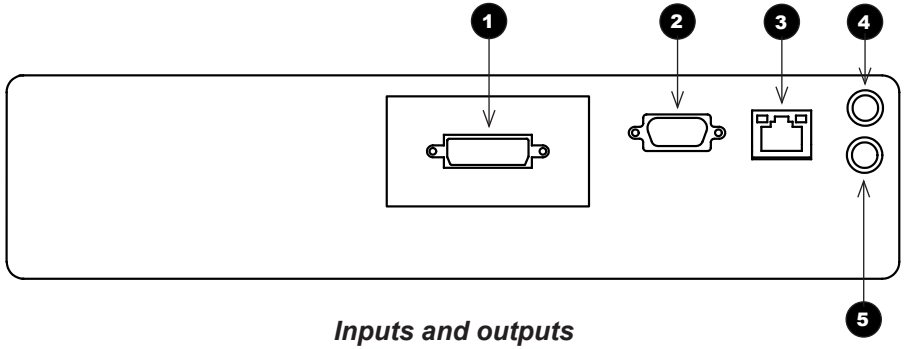
Control connections

2 **RS232**
The projector features can be controlled via a serial connection, using commands described in the ***Protocol Guide***.
Use a null-modem cable to connect directly to a computer, or a straight cable to connect to a modem.

3 **LAN**
The projector can be controlled via a LAN connection, using commands described in the ***Protocol Guide***.
Alternatively, use the Projector Control Utility described in the ***Operating Guide***.
Use a crossed LAN cable to connect directly to a computer, or an uncrossed cable to connect to a network hub.

4 **Wired remote output**
To synchronise the control of multiple projectors, connect the wired remote output of one projector to the wired remote input of another.

5 **Wired remote input**
If infrared signals from the remote control cannot reach the projector due to excessive distance or obstructions such as walls or cabinet doors, you can connect an external IR repeater to the remote control input, and position its IR sensor within range of the operator.



Inputs and outputs

Notes

*For a complete listing of pin configurations for all signal and control connectors, see **Wiring Details** later in this guide.*

*For a list of all commands used to control the projector via an RS232 or LAN connection, see the **Protocol Guide**.*

*For details on using the Projector Control Utility, see the **Operating Guide**.*

*For further information about LAN connectivity, see **Control Connections** in the **Reference Guide**.*

Only one remote connection (RS232 or LAN) should be used at any one time.

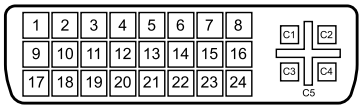
Plugging in the remote control cable will disable the infrared receivers.

Wiring Details

Signal input: DVI

24 way D-type connector

Pin 1	TMDS data 2−	Digital red− (link 1)
Pin 2	TMDS data 2+	Digital red+ (link 1)
Pin 3	TMDS data 2/4 shield	
Pin 4	TMDS data 4−	Digital green− (link 2)
Pin 5	TMDS data 4+	Digital green+ (link 2)
Pin 6	DDC clock	
Pin 7	DDC data	
Pin 8	Analog vertical sync	
Pin 9	TMDS data 1−	Digital green− (link 1)
Pin 10	TMDS data 1+	Digital green+ (link 1)
Pin 11	TMDS data 1/3 shield	
Pin 12	TMDS data 3-	Digital blue− (link 2)
Pin 13	TMDS data 3+	Digital blue+ (link 2)
Pin 14	+5 V	Power for monitor when in standby
Pin 15	Ground	Return for pin 14 and analog sync
Pin 16	Hot plug detect	
Pin 17	TMDS data 0−	Digital blue− (link 1) and digital sync
Pin 18	TMDS data 0+	Digital blue+ (link 1) and digital sync
Pin 19	TMDS data 0/5 shield	
Pin 20	TMDS data 5−	Digital red− (link 2)
Pin 21	TMDS data 5+	Digital red+ (link 2)
Pin 22	TMDS clock shield	
Pin 23	TMDS clock+	Digital clock+ (links 1 and 2)
Pin 24	TMDS clock−	Digital clock− (links 1 and 2)
C1	unused	
C2	unused	
C3	unused	
C4	unused	
C5	unused	



DVI: pin view of female connector

Notes

High-bandwidth Digital Content Protection (HDCP) is supported on this input.

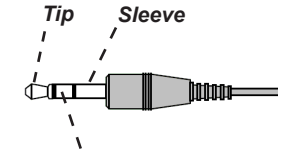
*For full details of all network settings, see **Discover Page** in the **Operating Guide**.*

Control connections

Wired remote control

3.5mm mini jack

Tip	Power
Ring	Signal
Sleeve	Ground



pin view of female connector

RS232

9 way D-type connector

1 unused

2 Received Data (RX)

3 Transmitted Data (TX)

4 unused

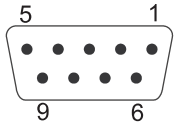
5 Signal Ground

6 unused

7 unused

8 unused

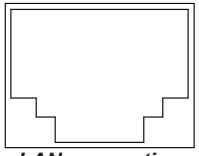
9 unused



RS232:
pin view of female connector

LAN connection

RJ45 socket



LAN connection

Notes

*For full details of all network settings, see **Discover Page** in the **Operating Guide**.*

Note that plugging in the remote control cable will disable the infra-red.

Only one remote connection (RS232 or LAN) should be used at any one time.

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DIGITAL PROJECTION

OPERATING GUIDE

HIGHlite 8000 Series

High Brightness Digital Video Projector

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The HIGHlite Projector Control Utility

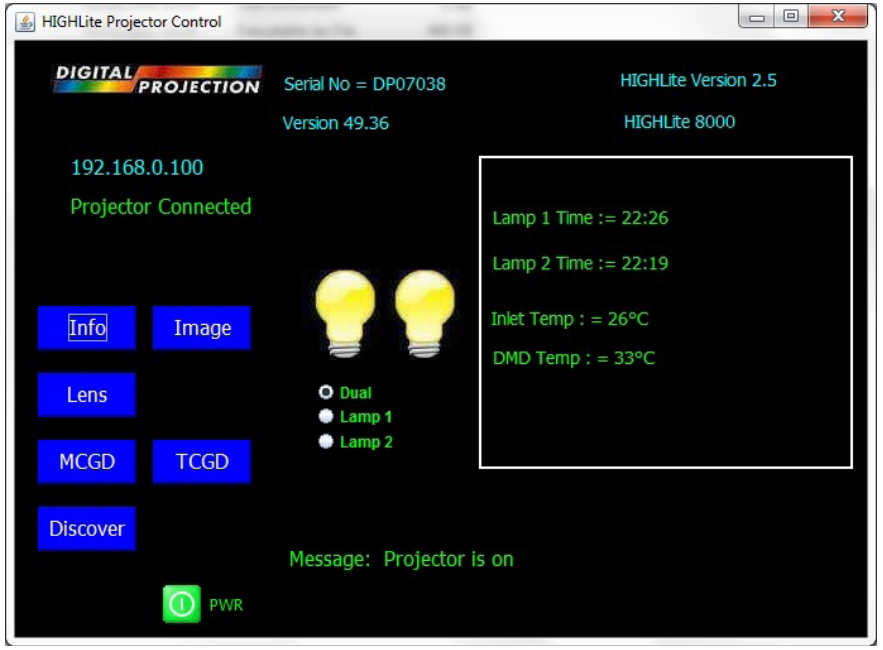
The HIGHlite Projector Control Utility provides an intuitive interface to enable control of many of the features of the projector from a personal computer, via a LAN connection.

Because the projector is not equipped with an on-screen display, most of the features are only available from external control applications such as this.

When the Utility is started, the ***Info*** page will display immediately.

The page buttons are always visible at the side of the display. Use the page buttons to navigate.

If the projector is able to connect to the computer, you will see the screen shown here. (In the example, the projector is ON.)



The PWR button

- Click **PWR** to switch the projector into STANDBY mode. The button will turn red.
- Click **PWR** to switch the projector on. The button will turn green.

Notes

*To use the **HIGHlite Projector Control Utility,** the **Java Runtime Environment** software must be installed on your computer. This software can be downloaded free of charge from www.java.com.*

*The **LAN IP Address** of the projector can be found on **the Discover page** of the Utility.*

The Utility can be used to control only one projector at a time, and only one instance can be running at one time.

More than one computer should be used to control more than one projector on the same network.

Some information, such as temperature, is not available when the projector is in STANDBY mode.

Info Page

The ***Info*** page is the first to display when the HIGHlite Projector Control Utility is started.

To navigate to the ***Info*** page at any time,

- click the **Info** page button.

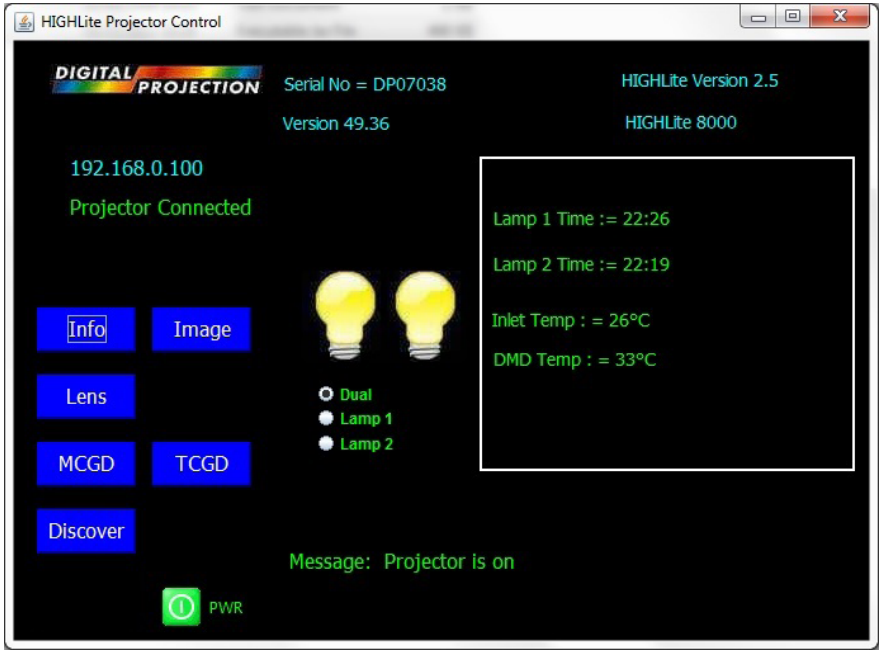
Information shown on the Info page

- Projector serial number
- Firmware version
- Model name
- Software version
- IP address
- Connection status
- Lamp mode
- Lamp hours
- Total hours
- Temperatures
- Lamp status icon
- Status message

Changing the lamp mode

To change the lamp mode, select from:

- Dual
- Lamp 1
- Lamp 2



Notes

Image Page

The ***Image*** page gives access to:

- Shutter controls (hiding and showing the projected image)
- Projector orientation
- Test patterns
- Brightness and Contrast settings

To navigate to the ***Image*** page at any time,

- click the **Image** page button.

Opening and closing the shutter

- To close the shutter and hide the projected image, click **Pic Mute**.
- To open the shutter and show the projected image, click **Pic Unmute**.

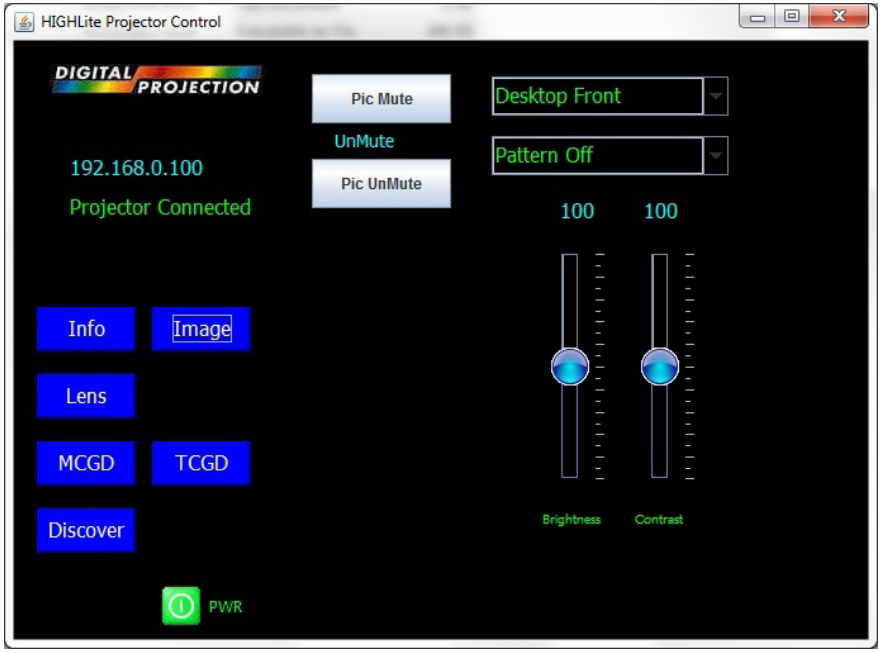
The shutter is open by default.

Adjusting projector orientation

Depending on how the projector is mounted, select the appropriate setting from the drop-down list:

Brightness and Contrast sliders

- Use the **Brightness** and **Contrast** sliders to make adjustments.
- Click on the value number to return to the default value.

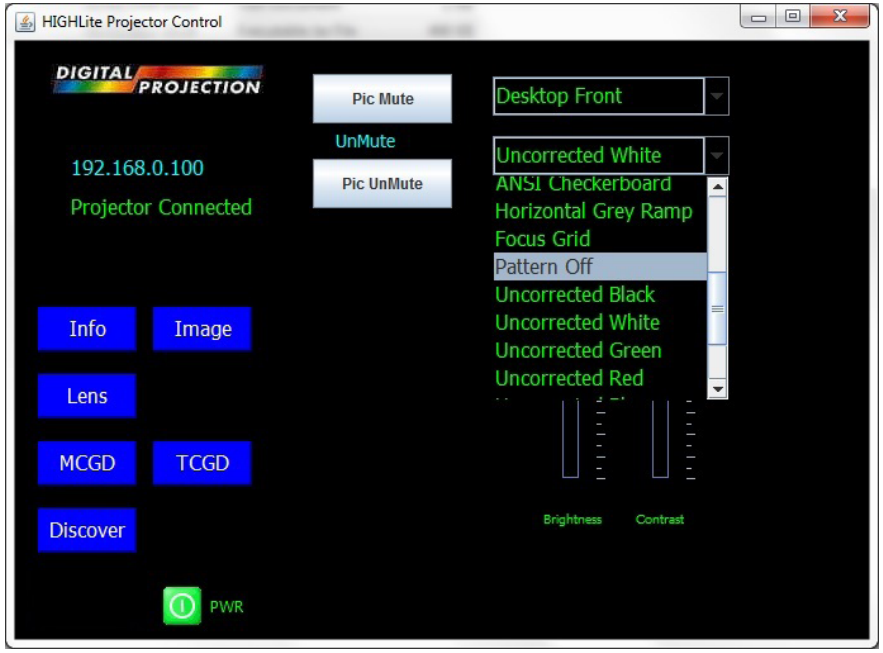


Notes

Image settings are retained after a power cycle.

Test Pattern

Select a test pattern from the drop-down list, or select **Pattern Off** to return to the input signal.



Notes

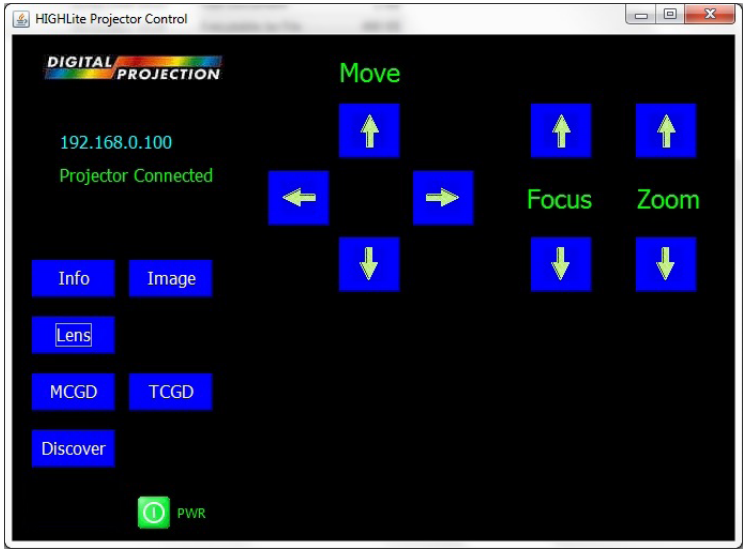
Lens Page

To navigate to the ***Lens*** page at any time,

- click the **Lens** page button.

Lens controls

1. Click and hold an arrow button to move, focus and zoom the lens.
2. Hold the button until the desired settings are achieved.
3. Release the button to stop the lens from moving.



Notes

You can also adjust the lens using the remote control. For further information, see ***Adjusting the lens*** *in the* ***Installation and Quick-Start Guide****.*

MCGD Page

MCGD (Measured Color Gamut Data) can be used to correct for a number of environmental variables, for example:

- two or more different projectors
- lamp age
- different lenses
- ambient light
- screen characteristics

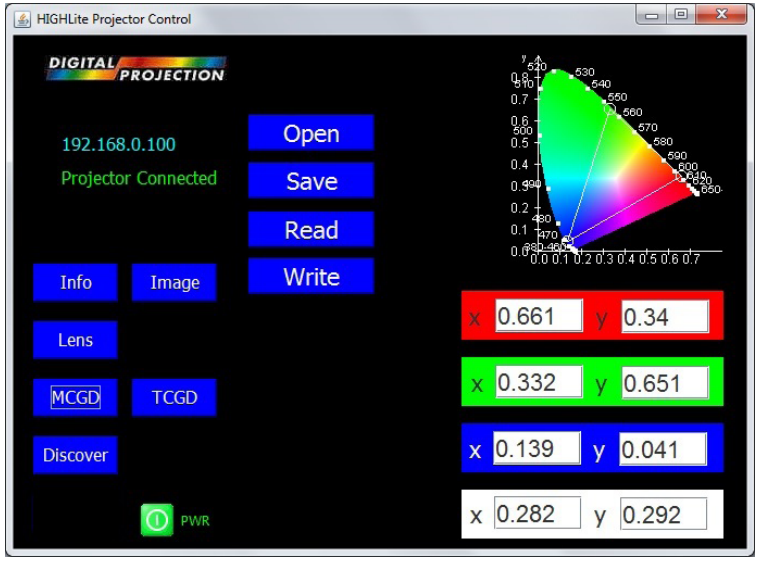
The parameters entered on the MCGD page establish the starting settings from which the projector will calculate what adjustments are necessary to achieve the color gamut specified on the TCGD page.

Only one set of MCGD data can be stored on the projector, but many more can be stored on a computer, and retrieved using the MCGD page controls.

To navigate to the ***MCGD*** page at any time,

- click the **MCGD** page button.

On first entering the ***MCGD*** page, the MCGD values will show those currently loaded into the projector.



Notes

The MCGD measurement procedure

1. On the ***Image*** page, select the **White Uncorrected** test pattern.
2. Using a photospectrometer, measure and record the following values:

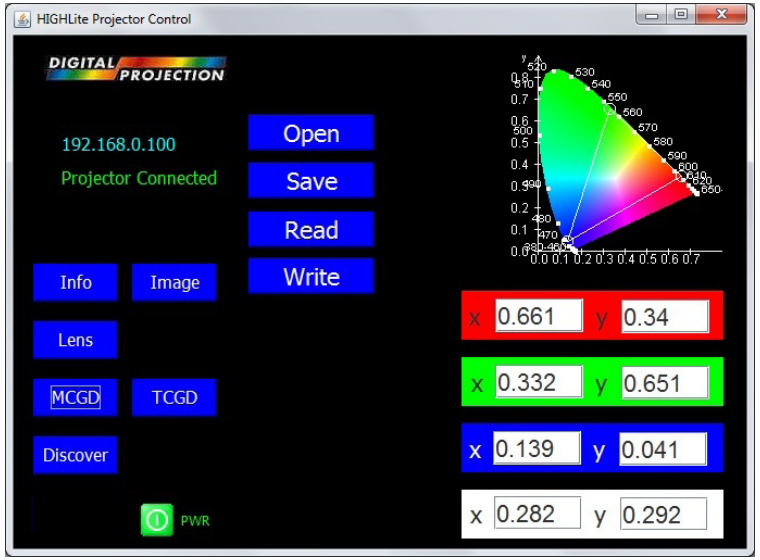
   White x y
3. On the ***Image*** page, select the **Red Uncorrected** test pattern.
4. Using a photospectrometer, measure and record the following values:

   Red x y
5. Continue this process for the green and blue measurements. Enter all values into the ***MCGD*** page.

Working with MCGD values

The buttons on the MCGD page are used to perform the following functions:

- **Open** retrieves MCGD values saved to an MCGD file on the computer.
- **Save** writes the values on the screen to an MCGD file on the computer. You can create a new file or overwrite an existing one.
- **Read** shows the values currently loaded into the projector.
- **Write** loads the values currently on screen to the projector.



Notes

When you create a new MCGD file, please make sure you type the file extension `.mcgd`.

New MCGD values will not take effect until the **Write** *button is pressed.*

TCGD Page

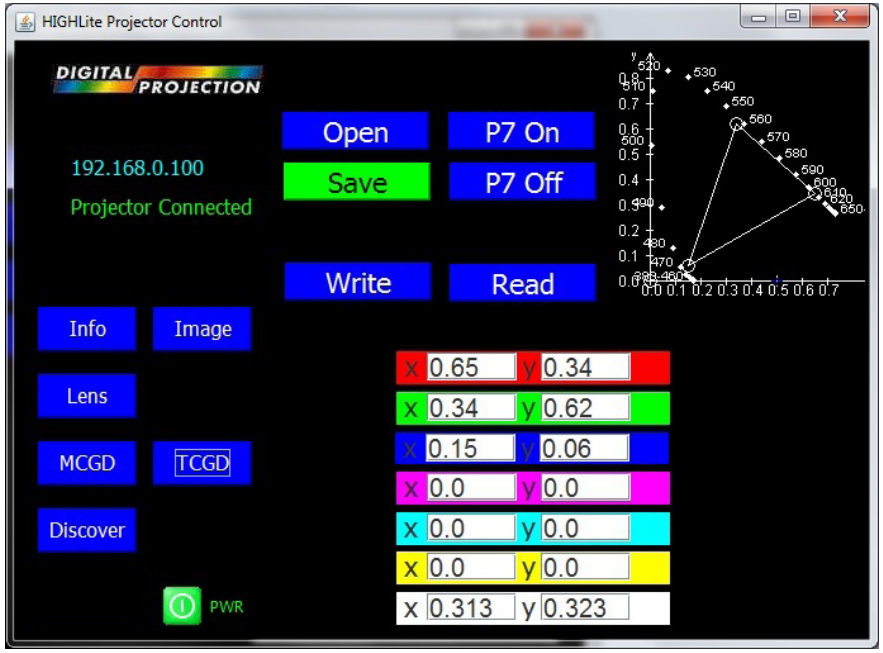
TCGD (Target Color Gamut Data) can be used to match the display to a predefined color gamut, for example:

- to match the MCGD values from another projector
- to match a specification from the film maker

The parameters entered on the TCGD page establish the target settings that the projector needs to aim for, in order to give a specified color gamut.

To navigate to the ***TCGD*** page at any time,

- click the **TCGD** page button.

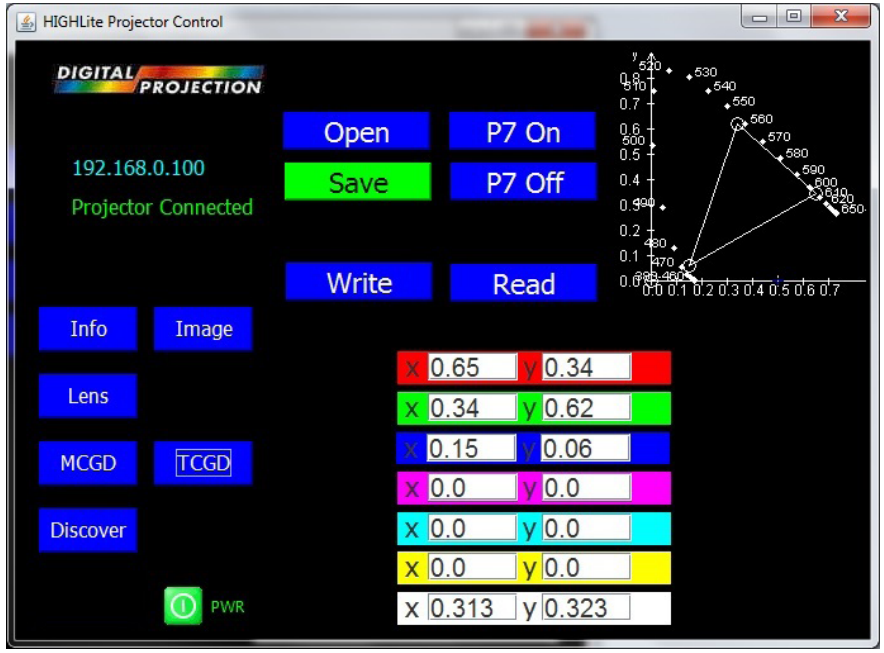


Notes

Working with TCGD values

Use the buttons on the ***TCGD*** page to do the following:

- **Open** retrieves sets of TCGD values saved to a TCGD file on the computer..
- **Save** writes the values on the screen to a TCGD file on the computer. You can create a new file or overwrite an existing one.
- **P7 On** and **P7 Off** enable and disable P7 color space.
- **Write** loads the values currently on the screen to the projector.
- **Read** shows the values currently loaded into the projector.



Notes

When you create a new TCGD file, please make sure you type the file extension `.tcgd`.

New TCGD values will not take effect until the **Write** *button is clicked.*

Discover Page

If any projectors are found on the network, then its LAN IP address will be listed in the panel and marked ***Online***. The first projector in the list will be connected to if possible.

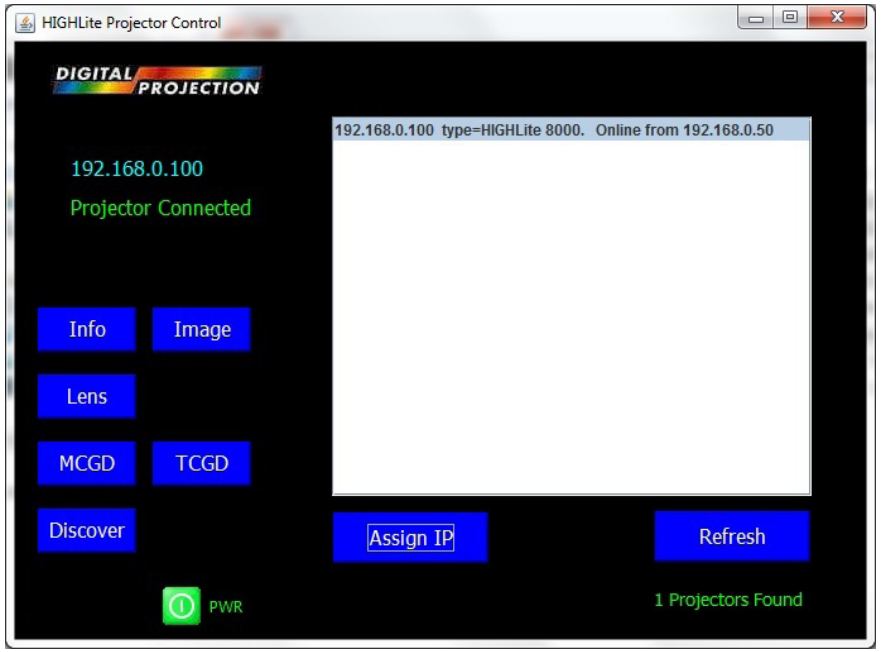
Projector Connected will be shown at the top left, together with the projector's IP address.

The ***Discover*** page can be used to switch control between multiple projectors.

To navigate to the ***Discover*** page at any time,

- click the **Discover** page button.

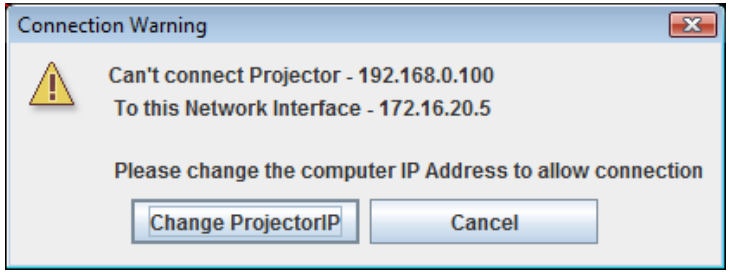
Use the **Refresh** button to update the list of projectors on the network. The userware will automatically connect to the first projector from the list.



Unreachable projectors

If a projector is found on the network, but cannot be connected to, a dialogue box will appear indicating why the projector cannot be connected.

The most common reason is different subnets.


Connection Warning
Can't connect Projector - 192.168.0.100
To this Network Interface - 172.16.20.5
Please change the computer IP Address to allow connection
Change ProjectorIP
Cancel

Notes

The HIGHlite 8000 Control Utility can be used to control only one projector at a time, and only one instance can be running at one time.

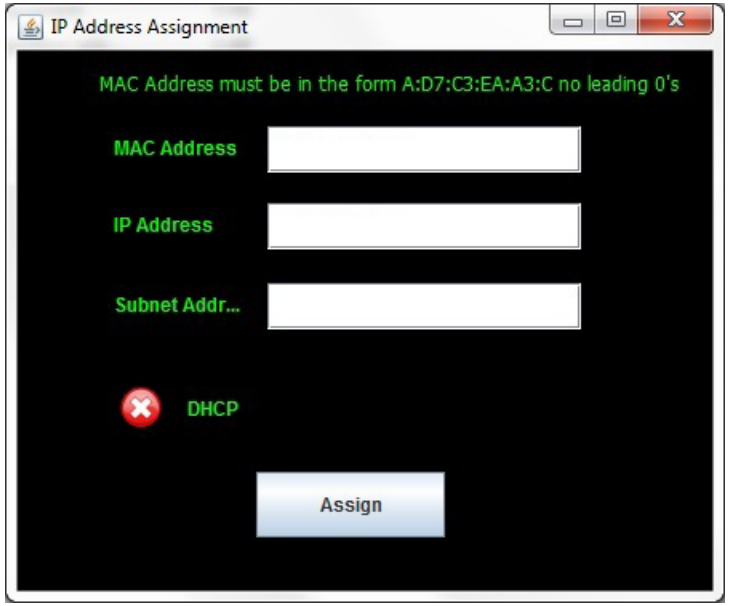
More than one computer should be used to control more than one projector on the same network.

Make sure the projector you want to control is connected to the computer before you run the Utility.

Assign IP

Click **Assign IP** to change the IP settings of the projector. You may need to configure your PC to connect to the projector in order to make changes.

The ***IP Address Assignment*** dialog will open in a new window.



Notes

The HIGHlite 8000 Control Utility can be used to control only one projector at a time, and only one instance can be running at one time.

More than one computer should be used to control more than one projector on the same network.

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DIGITAL PROJECTION

MAINTENANCE GUIDE

HIGHlite 8000 Series

High Brightness Digital Video Projector

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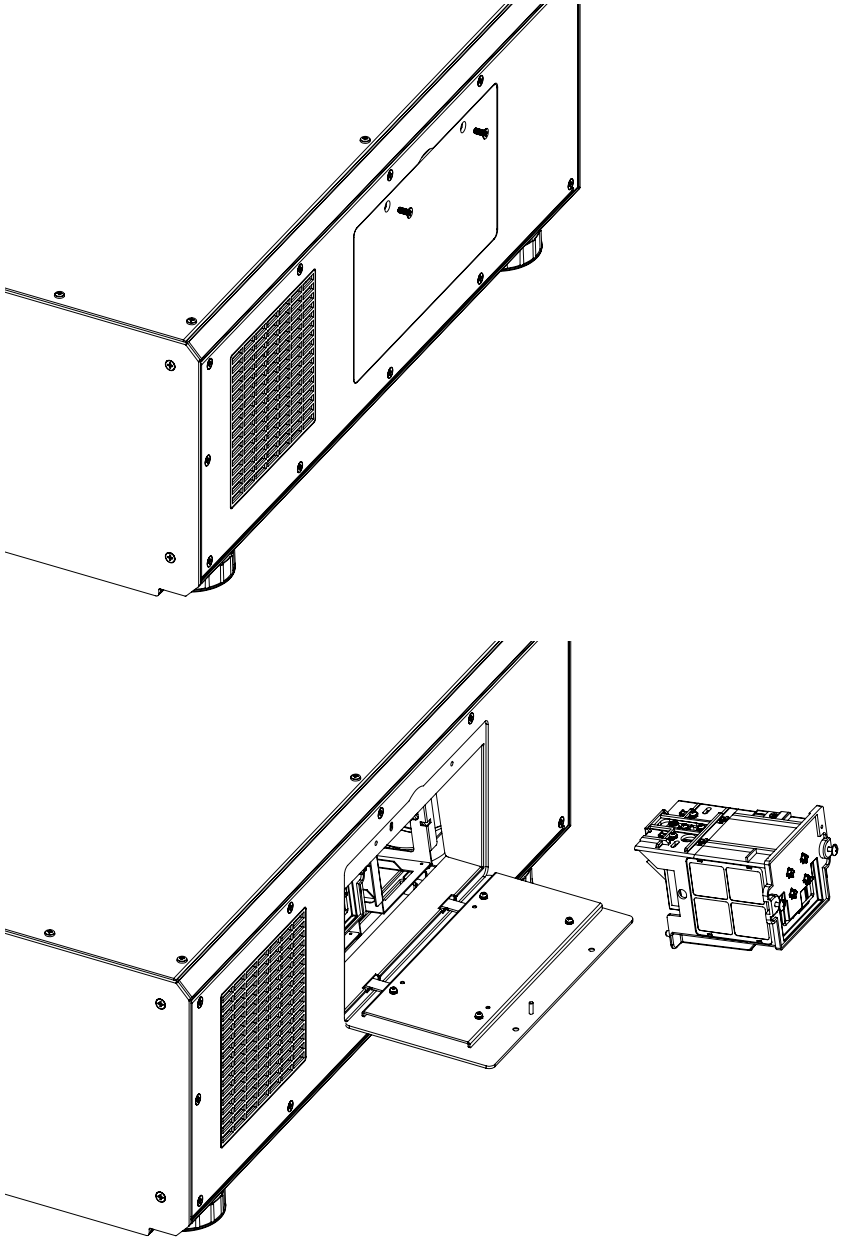
Changing A Lamp Module

1. Turn the power OFF and allow the lamp to cool for 5 minutes.
2. Unscrew the two screws securing the lamp door, and hinge the door down.
3. Unscrew the two crosshead screws securing the lamp module to the projector.
4. Lift the wire handle up and use it to pull out the lamp module.
5. Fit a new lamp module, pushing it firmly into place.
6. Tighten the two cross-head screws.
7. Hinge the lamp door back into the closed position. Tighten the two retaining screws.



Notes

Always allow the lamp to cool for 5 minutes before:
- disconnecting the power
- moving the projector
- changing a lamp module

There are no user-serviceable parts inside the lamp module. Replace the whole module.

Use only lamps supplied by Digital Projection and intended for this projector. Fitting any other lamp could damage both projector and lamp, and will invalidate the warranty.

At the end of a lamp life the lamp will not strike and the ERROR indicator on the control panel will flash red. (Typical lamp life is 2000 hours.)

Do not use the lamp for more than 2000 hours as this may cause serious lamp failure, damage the lamp module and cause extra cost on replacement.

Take care not to touch the glass surface of the lamp module. If you touch the glass, it should be cleaned before use.

HID lamps produce high intensity light. Do not look directly at the light coming from the lamp housing or the lens.

Opening the lamp door will switch the projector OFF. The projector cannot be operated until the door is fully closed.

Changing The Air Filters

The air filters should be changed only by qualified and authorised service personnel.

Contact your Digital Projection Dealer.

Notes

DIGITAL PROJECTION

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HIGHlite 8000 Series

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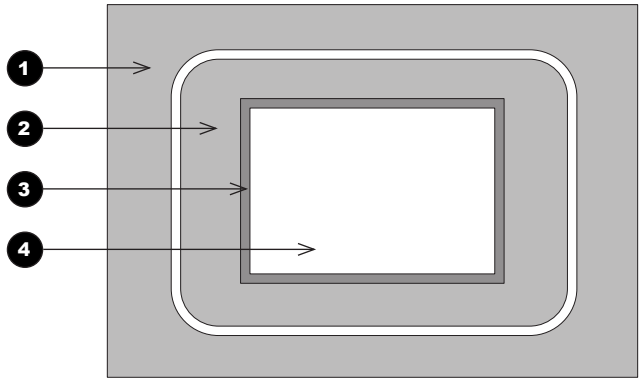
The DMD™

A DMD™ (Digital Micromirror Device™) is a true digital light modulator which utilises an array of up to 2.3 million moving aluminium mirrors, with each one representing a pixel in the final projected image. The outermost micromirrors in the array remain inactive and are not used in constructing the image.

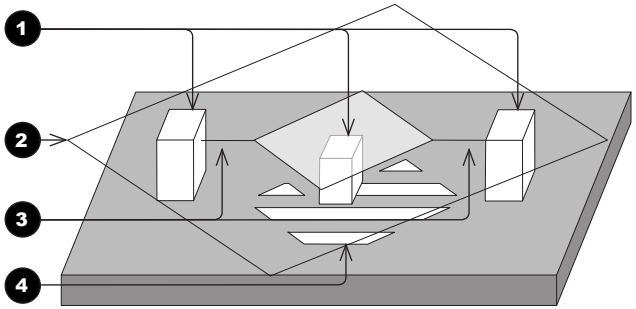
1. **Casing**
2. **Light shield**
3. **Inactive mirrors**
4. **Array**



DMD

Each mirror element is suspended over address electrodes by a torsion hinge between two posts.

1. **Support posts**
2. **Mirror element**
3. **Torsion hinges**
4. **Offset address electrode**



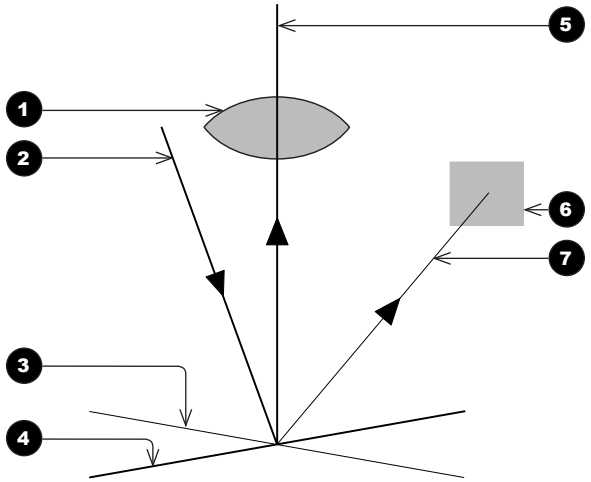
Mirror element with tilt mechanism

Notes

The DMD™ (continued)

Depending on the voltage polarity applied, each mirror will either tilt to the left to produce a bright pixel or to the right for a dark pixel. When light is applied to the complete DMD™, only the light redirected from a mirror tilting to the left is projected.

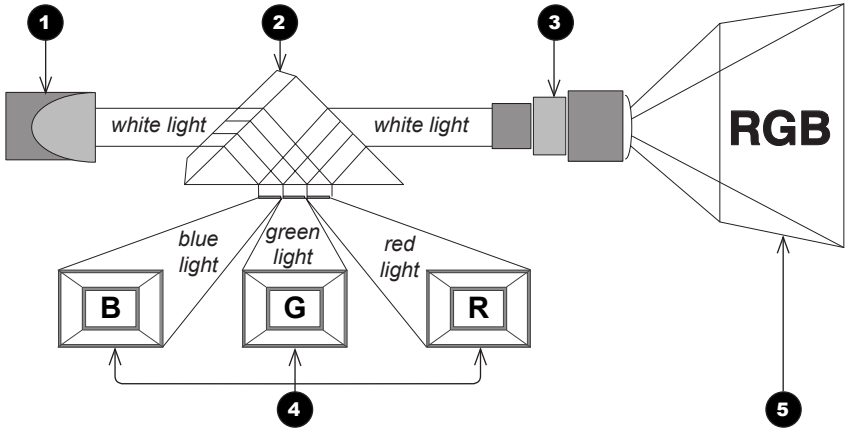
1. **Projection lens**
2. **Incoming light from the lamp**
3. **Mirror element tilted to the right**
4. **Mirror element tilted to the left**
5. **Reflected light, left tilt**
6. **Light dump**
7. **Reflected light, right tilt**



Light flow

The projector optically filters white light from the lamp into its constituent red, green and blue. Each color illuminates a separate DMD™ whose modulated output is then recombined with the other two to form the projected full color image.

1. **Lamp**
2. **Optical filtering of light into red, green and blue**
3. **Projection lens**
4. **DMD™ devices**
5. **Full color image displayed on screen**



Filtering process

Notes

Screen Requirements

Diagonal screen sizes

Screen sizes are sometimes specified by their diagonal size (D). When dealing with large screens and projection distances at different aspect ratios, it is more convenient to measure screen width (W) and height (H).

The example calculations below show how to convert diagonal sizes into width and height, at various aspect ratios.

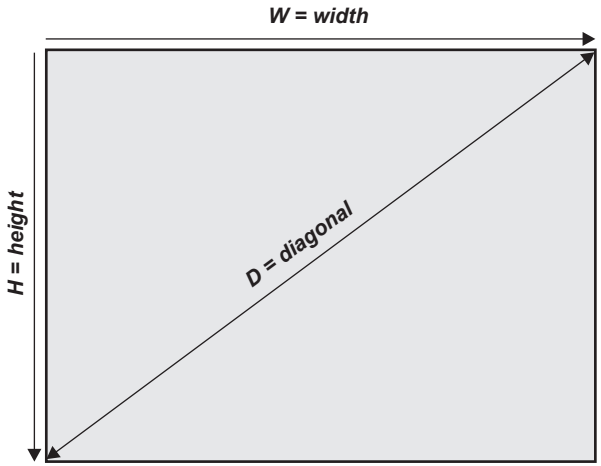
2.35:1 (Scope)
W = D x 0.92 ***H*** = D x 0.39

1.85:1
W = D x 0.88 ***H*** = D x 0.47

16:9 = 1.78:1 (native aspect ratio for 1080p projectors)
W = D x 0.87 ***H*** = D x 0.49

1.66:1 (Vista)
W = D x 0.86 ***H*** = D x 0.52

16:10 = 1.6:1 (native aspect ratio for WUXGA projectors)
W = D x 0.85 ***H*** = D x 0.53



Notes

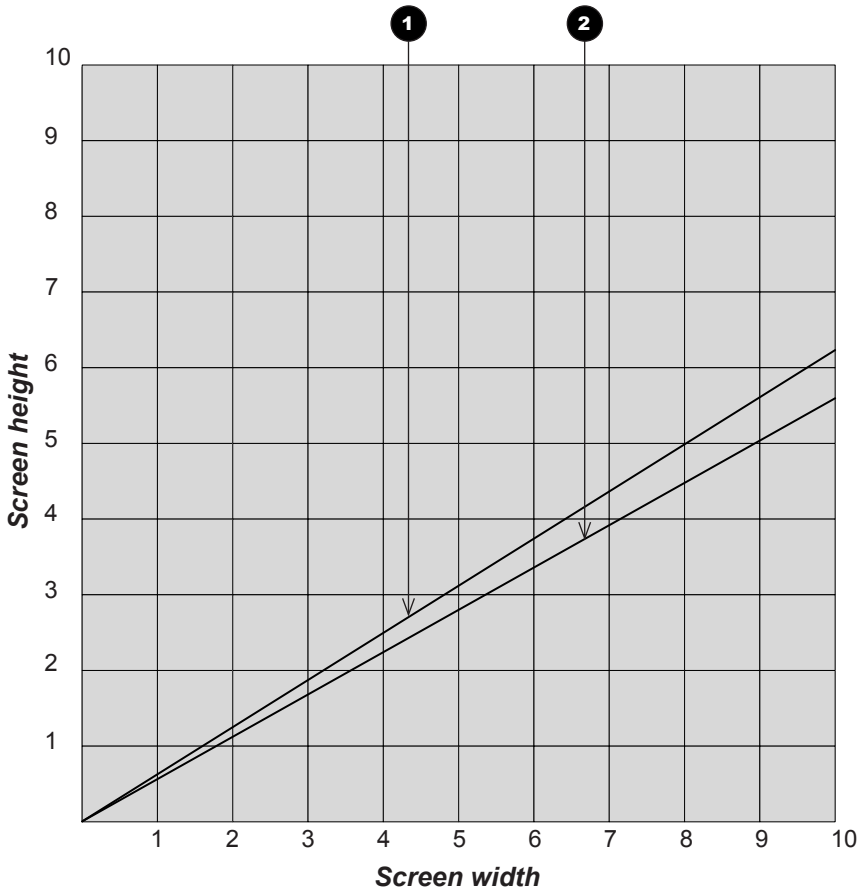
Fitting the image to the screen

It is important that your screen is of sufficient height and width to display images at all the aspect ratios you are planning to use.

Use the conversion chart, or the sample calculations below to check that you are able to display the full image on your screen. If you have insufficient height or width, you will have to reduce the overall image size in order to display the full image on your screen.

1 **16:10 = 1.6:1**
(native aspect ratio for WUXGA projectors)
W = H x 1.6, H = W x 0.625

2 **16:9 = 1.78:1**
(native aspect ratio for 1080p projectors)
W = H x 1.78, H = W x 0.56

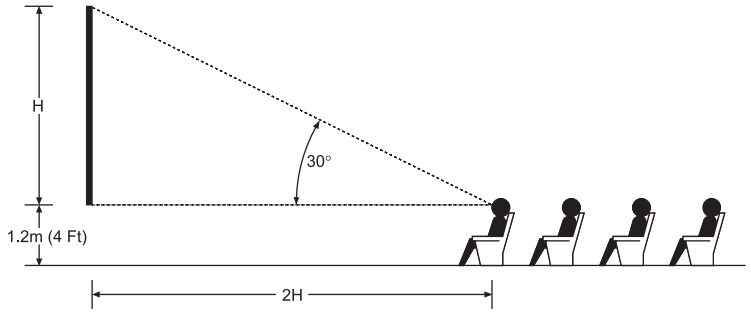


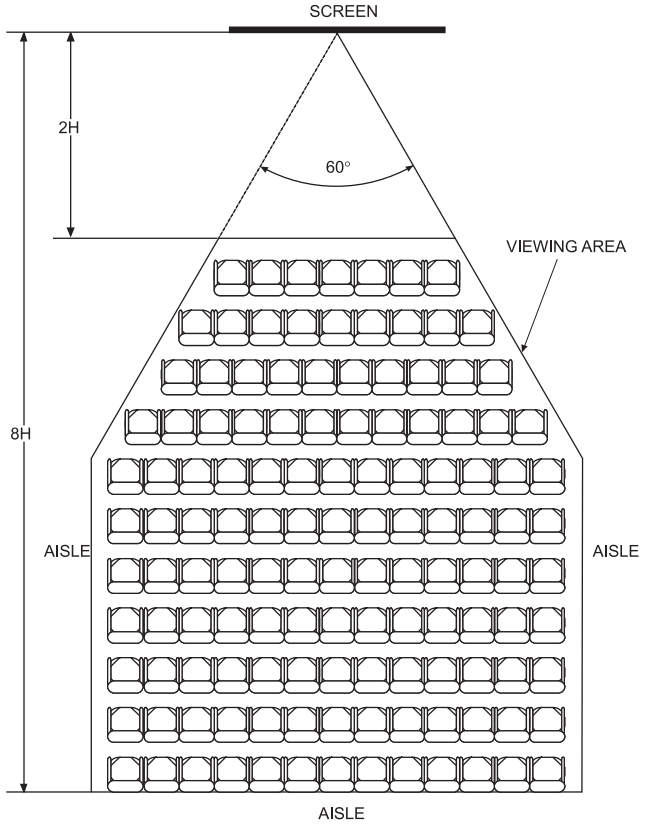
Notes

Positioning the screen and projector

For optimum viewing, the screen should be a flat surface perpendicular to the floor. The bottom of the screen should be 1.2 m (4 ft) above the floor and the front row of the audience should not have to look up more than 30° to see the top of the screen.

The distance between the front row of the audience and the screen should be at least twice the screen height and the distance between the back row and the screen should be a maximum of 8 times the screen height. The screen viewing area should be within a 60° range from the face of the screen.





Notes

The projector should be installed as close to the power outlet as possible.

The power connection should be easily accessible, so that it can be disconnected in an emergency.

Ensure that there is at least 30 cm (12 in.) of space between the ventilation outlets and any wall, and 10 cm (4 in.) on all other sides.

Do not install the projector close to anything that might be affected by its operational heat, for instance, polystyrene ceiling tiles, curtains etc.

*The image can be flipped for rear projection (see **Image Page** in the **Operating Guide**) and displayed without the need for extra mirrors or equipment.*

However, you must ensure that there is sufficient distance behind the screen for the projector to be correctly located.

Rear installation is generally more complicated and advice should be sought from your local dealer before attempting it.

Choosing A Lens

A number of lenses are available. Which lens you choose depends on the screen size, image aspect ratio, throw distance and light output.

The following table shows all available lenses in order of their ***throw ratios***:

Throw ratios	Throw distance range
0.77 : 1 fixed lens	1.3 - 2.5 m (4.3 - 8.2 ft)
1.16 : 1 fixed lens	1.4 - 6.2 m (4.6 - 20.3 ft)
1.45 - 1.74 : 1 zoom lens	1.8 - 9.3 m (5.9 - 30.5 ft)
1.74 - 2.17 : 1 zoom lens	2.2 - 11.8 m (7.2 - 38.7 ft)
2.17 - 2.90 : 1 zoom lens	2.7 - 15.4 m (8.9 - 50.5 ft)
2.90 - 4.34 : 1 zoom lens	3.6 - 22.5 m (11.8 - 73.8 ft)
4.34 - 6.76 : 1 zoom lens	5.5 - 35 m (18 - 115 ft)

To choose a lens, either calculate the ***throw ratio*** required, or use the ***lens charts*** provided within this section.

Notes

*For information about individual lens part numbers, see **Appendix A** at the end of this document.*

Choosing a lens by calculation

Basic calculation

Identify the required lens by calculating the ***throw ratio***.

A ***throw ratio*** is the ratio of the throw distance to the screen width:

$$\text{Throw ratio factor} = \frac{\text{DMD width}}{\text{Image width in pixels}}$$

$$\text{Throw ratio} = \frac{\text{Throw distance}}{\text{Screen width}}$$

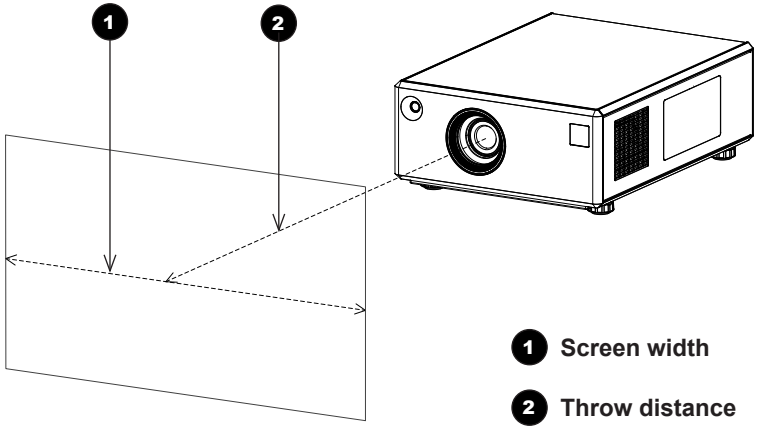
1. Use the formula above to obtain the required throw ratio.

$$\text{Throw ratio} = \frac{\text{Throw distance}}{\text{Screen width x Throw ratio factor}}$$

2. Match the throw ratio with a lens from the table below:

Throw ratios	Throw distance range
0.77 : 1 fixed lens	1.3 - 2.5 m (4.3 - 8.2 ft)
1.16 : 1 fixed lens	1.4 - 6.2 m (4.6 - 20.3 ft)
1.45 - 1.74 : 1 zoom lens	1.8 - 9.3 m (5.9 - 30.5 ft)
1.74 - 2.17 : 1 zoom lens	2.2 - 11.8 m (7.2 - 38.7 ft)
2.17 - 2.90 : 1 zoom lens	2.7 - 15.4 m (8.9 - 50.5 ft)
2.90 - 4.34 : 1 zoom lens	3.6 - 22.5 m (11.8 - 73.8 ft)
4.34 - 6.76 : 1 zoom lens	5.5 - 35 m (18 - 115 ft)

3. Ensure the required throw distance is within the range covered by the lens.



1 **Screen width**

2 **Throw distance**

Notes

The basic calculation on this page does not take into consideration DMD™ and image size, which could affect the throw ratio. For a more complex and realistic calculation, see ***Full lens calculation*** *in this section.*

When calculating the throw ratio, be sure to use identical measurement units for both the throw distance and the screen width.

For information about individual lens part numbers, see ***Appendix A*** *at the end of this document.*

Basic calculation example

1. **Calculate the throw ratio using the formula.**

   Your screen is ***4.5m*** wide and you wish to place the projector approximately ***11m*** from the screen. The throw ratio will then be

   $$\frac{11}{4.5} = \mathbf{2.44}$$

2. **Match the result with the lens table.**

   The lens matching a throw ratio of 2.44 is ***the 2.17 - 2.90 : 1 zoom lens***.

3. **Check whether the lens covers the required throw distance.**

   The range quoted for the 2.17 - 2.90 : 1 zoom lens is ***2.7 - 15.4m***. The required distance of 11m is within the range.

INFORMATION YOU NEED FOR THIS CALCULATION

- The throw ratio formula:

$$\textit{Throw ratio} = \frac{\textit{Throw distance}}{\textit{Screen width}}$$

- The lens table:

Throw ratios	Throw distance range
0.77 : 1 fixed lens	1.3 - 2.5 m (4.3 - 8.2 ft)
1.16 : 1 fixed lens	1.4 - 6.2 m (4.6 - 20.3 ft)
1.45 - 1.74 : 1 zoom lens	1.8 - 9.3 m (5.9 - 30.5 ft)
1.74 - 2.17 : 1 zoom lens	2.2 - 11.8 m (7.2 - 38.7 ft)
2.17 - 2.90 : 1 zoom lens	2.7 - 15.4 m (8.9 - 50.5 ft)
2.90 - 4.34 : 1 zoom lens	3.6 - 22.5 m (11.8 - 73.8 ft)
4.34 - 6.76 : 1 zoom lens	5.5 - 35 m (18 - 115 ft)

Notes

The basic calculation on this page does not take into consideration DMD™ and image size, which could affect the throw ratio. For a more complex and realistic calculation, see ***Full lens calculation*** *in this section.*

For information about individual lens part numbers, see ***Appendix A*** *at the end of this document.*

Full lens calculation

Introducing TRC

The choice of lens will affect the image size and will address discrepancies between the DMD™ resolution and the source.

When an image fills the height of the DMD™ but not the width, it uses less than 100% of the DMD™ surface. A lens chosen using the basic formula may produce an image that is considerably smaller than the actual screen.

To compensate for loss of screen space in such situations, you need to increase the throw ratio using a ***Throw Ratio Correction (TRC)***.

Example

Fig. 1 illustrates a 4:3 image within a 1080p DMD™.

When a 1080p projector is used for a 4:3 image, the image does not fill the width of the DMD™, creating a ***pillarboxing*** effect - blank spaces to the left and right.

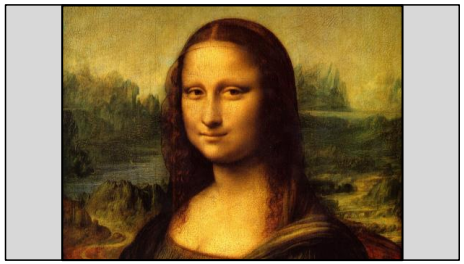


Fig. 1

Fig. 2 shows the same image projected on a 4:3 screen using a standard lens (chosen with the basic calculation).

The DMD™ accurately fills the width of the screen; however, the pillarboxing is now part of the projected image and is transferred to the screen.

The DMD™ does not fill the height of the screen, which has caused ***letterboxing*** - further blank spaces at the top and bottom of the screen.

The image is now surrounded by blank space, which can be removed if the throw ratio is increased.

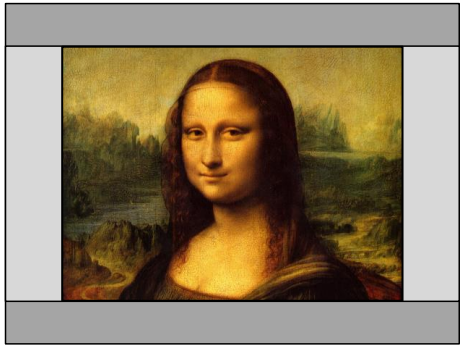


Fig. 2

Fig. 3 shows the image projected on the same screen with a lens chosen using TRC.

The increased throw ratio has allowed the 4:3 image to fill the 4:3 screen seamlessly.

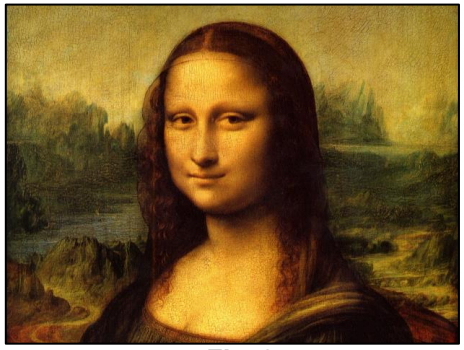


Fig. 3

Notes

TRC can only be applied if greater than 1. If TRC is 1 or less, disregard it and calculate the throw ratio using the basic formula.

Calculating TRC

To calculate TRC, use the following formula:

$$TRC = \frac{DMD™\ aspect\ ratio}{Source\ aspect\ ratio}$$

TRC table

Alternatively, you can save time by referencing the following table, which shows the TRC value for some popular image formats:

	HIGHlite 8000 1080p	*HIGHlite 8000 WUXGA*
2.35:1 (Scope), 1920 x 817 pixels	TRC < 1, not used	TRC < 1, not used
1.85:1 (Flat), 1920 x 1037 pixels	TRC < 1, not used	TRC < 1, not used
1.78:1 (16:9), 1920 x 1080	TRC = 1, not used (native resolution)	TRC < 1, not used
1.66:1 (Vista), 1792 x 1080 pixels	TRC = 1.07	TRC < 1, not used
1.6:1 (16:10), 1728 x 1080 pixels	TRC = 1.11	TRC = 1, not used (native resolution)
1.33:1 (4:3), 1440 x 1080 pixels	TRC = 1.33	TRC = 1.2
1.25:1 (5:4), 1350 x 1080 pixels	TRC = 1.42	TRC = 1.28

Notes

TRC can only be applied if greater than 1. If TRC is 1 or less, disregard it and calculate the throw ratio using the basic formula.

Calculating the throw ratio with TRC

1. For TRC > 1, amend the basic throw ratio formula as follows:

$$\textit{Throw ratio} = \frac{\textit{Throw distance}}{\textit{Screen width } \boldsymbol{x\ TRC}}$$

2. Once a throw ratio is established, identify the matching lens from the table:

Throw ratios	Throw distance range
0.77 : 1 fixed lens	1.3 - 2.5 m (4.3 - 8.2 ft)
1.16 : 1 fixed lens	1.4 - 6.2 m (4.6 - 20.3 ft)
1.45 - 1.74 : 1 zoom lens	1.8 - 9.3 m (5.9 - 30.5 ft)
1.74 - 2.17 : 1 zoom lens	2.2 - 11.8 m (7.2 - 38.7 ft)
2.17 - 2.90 : 1 zoom lens	2.7 - 15.4 m (8.9 - 50.5 ft)
2.90 - 4.34 : 1 zoom lens	3.6 - 22.5 m (11.8 - 73.8 ft)
4.34 - 6.76 : 1 zoom lens	5.5 - 35 m (18 - 115 ft)

3. Ensure the required throw distance is within the range of the matching lens.

Notes

TRC can only be applied if greater than 1. If TRC is 1 or less, disregard it and calculate the throw ratio using the basic formula.

Full lens calculation example

Your screen is ***4.5m*** wide; you wish to place the projector approximately ***11m*** from the screen. You use a ***WUXGA*** projector; the source is ***4:3***.

1. Calculate TRC as follows:

$$TRC = \frac{1.6}{1.33} = 1.2$$

2. Calculate the throw ratio:

$$Throw\ ratio = \frac{11}{4.5 \times 1.2} = 2.04$$

3. Find a match in the lens table.

   The table shows that the matching lens is ***the 1.74 - 2.17 : 1 zoom lens***.

4. Check whether the lens covers the required throw distance.

   The range quoted for the 1.74 - 2.17 : 1 zoom lens is ***2.2 - 11.8m***. The required distance of 11m is within the range.

INFORMATION YOU NEED FOR THESE CALCULATIONS

- The TRC formula $TRC = \frac{DMD™\ aspect\ ratio}{Source\ aspect\ ratio}$

- The TRC table (to use instead of the formula)

	HIGHlite 8000 WUXGA
2.35:1 (Scope)	TRC not used
1.85:1 (Flat)	TRC not used
1.78:1 (16:9)	TRC not used
1.66:1 (Vista)	TRC not used
1.6:1 (16:10)	TRC not used (native resolution)
1.33:1 (4:3)	TRC = 1.2
1.25:1 (5:4)	TRC = 1.28

- The throw ratio formula $Throw\ ratio = \frac{Throw\ distance}{Screen\ width \times TRC}$

- The lens table:

Throw ratios	Throw distance range
0.77 : 1 fixed lens	1.3 - 2.5 m (4.3 - 8.2 ft)
1.16 : 1 fixed lens	1.4 - 6.2 m (4.6 - 20.3 ft)
1.45 - 1.74 : 1 zoom lens	1.8 - 9.3 m (5.9 - 30.5 ft)
1.74 - 2.17 : 1 zoom lens	2.2 - 11.8 m (7.2 - 38.7 ft)
2.17 - 2.90 : 1 zoom lens	2.7 - 15.4 m (8.9 - 50.5 ft)
2.90 - 4.34 : 1 zoom lens	3.6 - 22.5 m (11.8 - 73.8 ft)
4.34 - 6.76 : 1 zoom lens	5.5 - 35 m (18 - 115 ft)

Notes

Lens charts

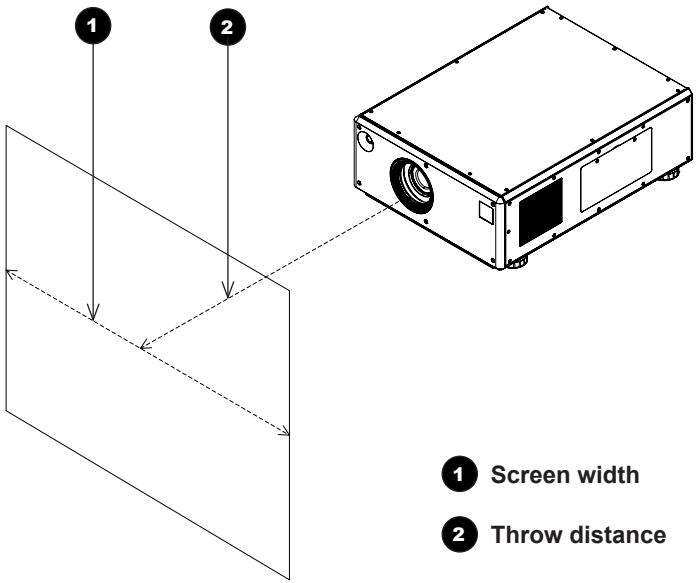
How to use the lens charts

The lens charts on the following pages provide a quick guide to the type of lens needed for a particular projector.

To use the lens charts, you need the following information:

- The DMD resolution of your projector
- The distance between the projector and the screen (throw distance)
- The maximum width of your screen

In the chart for the required DMD resolution, find the point where the throw distance corresponds to the screen width, as shown in the example below.



1 Screen width

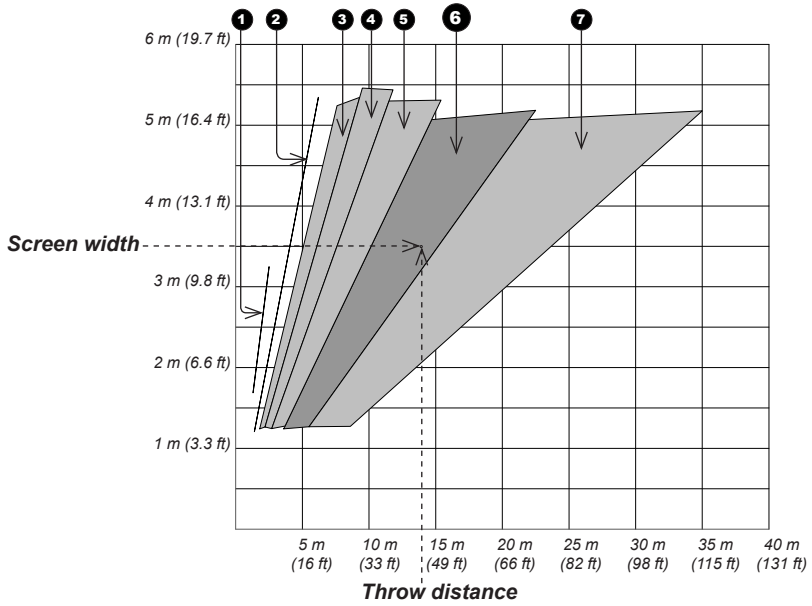
2 Throw distance

Example

For a 1080p projector with

- throw distance 14 m, and
- screen width 3.5 m,

the correct lens would be number 6 in the chart.



Notes

*For information about individual lens part numbers, see **Appendix A** at the end of this document.*

How to find the right lens chart

Charts are shown in order of DMD resolution, as follows:

- 1080p
- WUXGA

For each resolution, the available lenses are shown in different charts depending on applicable ***throw ratio corrections*** (TRC).

For each resolution, lens charts are arranged in ascending TRC order, starting from full width images, where TRC=1.

All full width images are grouped together. 1080p and WUXGA are shown in the same chart.

1080p (1920 x 1080 pixels)

Full width images

Formats that fit the width of the DMD™ without applying a throw ratio factor include:

- **2.35:1 (Scope)** 1920 x 817 pixels Throw ratio factor = 1
- **1.85:1 (Flat)** 1920 x 1037 pixels Throw ratio factor = 1
- **1.78:1 (16:9)** 1920 x 1080 pixels (native resolution) Throw ratio factor = 1

Full height images

A throw ratio factor has been applied to the following charts:

- **1.25:1 (5:4)** 1350 x 1080 pixels Throw ratio factor = 1.42
- **1.33:1 (4:3)** 1440 x 1080 pixels Throw ratio factor = 1.33
- **1.6:1 (16:10)** 1728 x 1080 pixels Throw ratio factor = 1.11
- **1.66:1 (Vista)** 1792 x 1080 pixels Throw ratio factor = 1.07

Notes

For information about individual lens part numbers, see ***Appendix A*** *at the end of this document.*

WUXGA (1920 x 1200 pixels)

Full width images

Formats that fit the width of the DMD™ without applying a throw ratio factor include:

- **2.35:1 (Scope)** 1920 x 817 pixels Throw ratio factor = 1
- **1.85:1 (Flat)** 1920 x 1037 pixels Throw ratio factor = 1
- **1.78:1 (16:9)** 1920 x 1080 pixels Throw ratio factor = 1
- **1.66:1 (Vista)** 1920 x 1156 pixels Throw ratio factor = 1
- **1.6:1 (16:10)** 1920 x 1200 pixels (native resolution) Throw ratio factor = 1

Full height images

A throw ratio factor has been applied to the following charts:

- **1.25:1 (5:4)** 1500 x 1200 pixels Throw ratio factor = 1.28
- **1.33:1 (4:3)** 1600 x 1200 pixels Throw ratio factor = 1.2

Notes

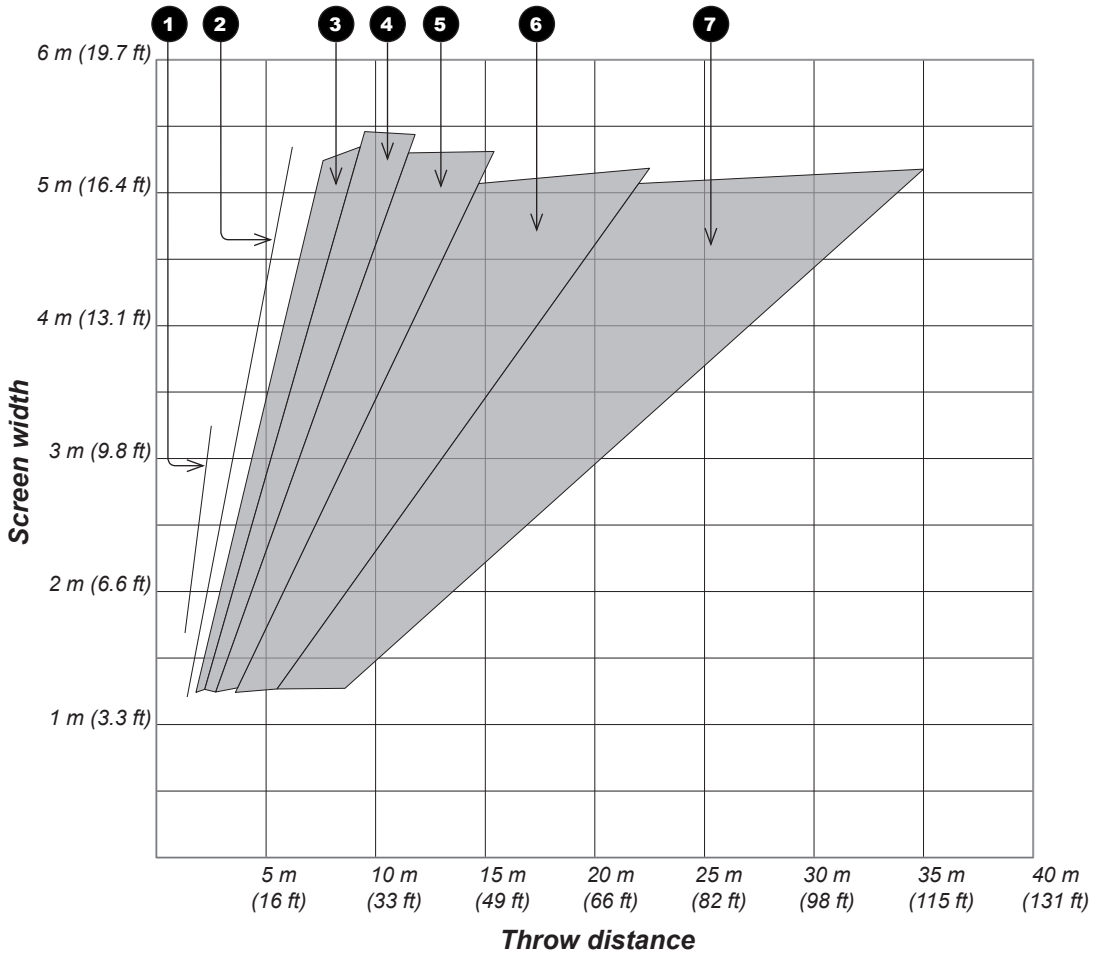
*For information about individual lens part numbers, see **Appendix A** at the end of this document.*

DMD™ resolution 1080p / WUXGA, full DMD™ width images

For 1080p, full width images are 2.35:1 (Scope), 1.85:1 (Flat) 1.78:1 (native).

For WUXGA, full width images are all of the above, plus 1.66:1 (Vista) and 1.6:1 (native).

1. **0.77 : 1 fixed lens**
2. **1.16 : 1 fixed lens**
3. **1.45 - 1.74 : 1 zoom lens**
4. **1.74 - 2.17 : 1 zoom lens**
5. **2.17 - 2.90 : 1 zoom lens**
6. **2.90 - 4.34 : 1 zoom lens**
7. **4.34 - 6.76 : 1 zoom lens**



Notes

This chart has a throw ratio factor of 1.0, for use with the following images:

For WUXGA:

2.35:1 (Scope), 1.85:1 (Flat), 1.78:1 (16:9), 1.66:1 (Vista) and 1.6:1 (native)

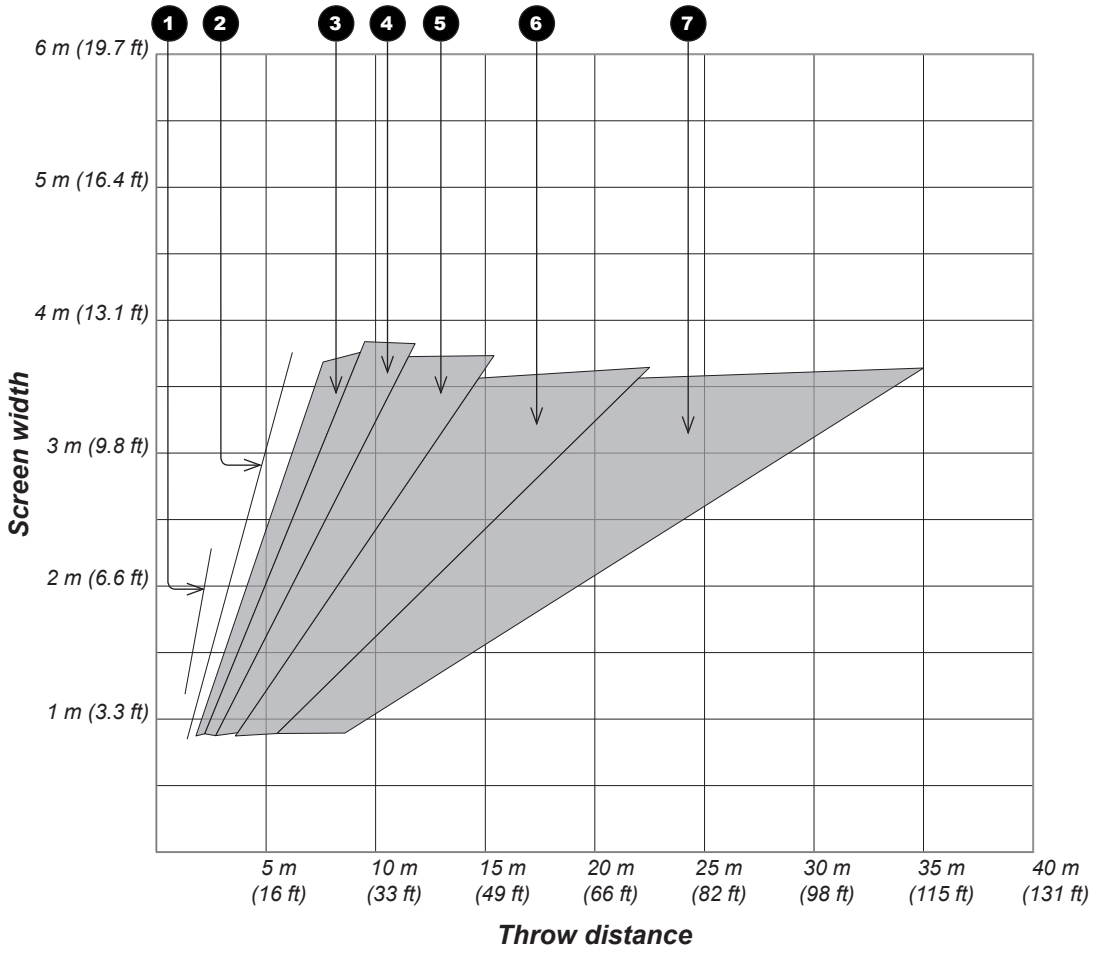
For 1080p:

2.35:1 (Scope), 1.85:1 (Flat) and 1.78:1 (native)

*For information about individual lens part numbers, see **Appendix A** at the end of this document.*

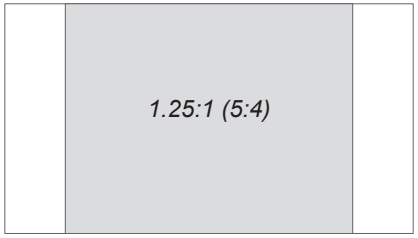
DMD™ resolution 1080p, 1.25:1 images

1. **0.77 : 1 fixed lens**
2. **1.16 : 1 fixed lens**
3. **1.45 - 1.74 : 1 zoom lens**
4. **1.74 - 2.17 : 1 zoom lens**
5. **2.17 - 2.90 : 1 zoom lens**
6. **2.90 - 4.34 : 1 zoom lens**
7. **4.34 - 6.76 : 1 zoom lens**



Notes

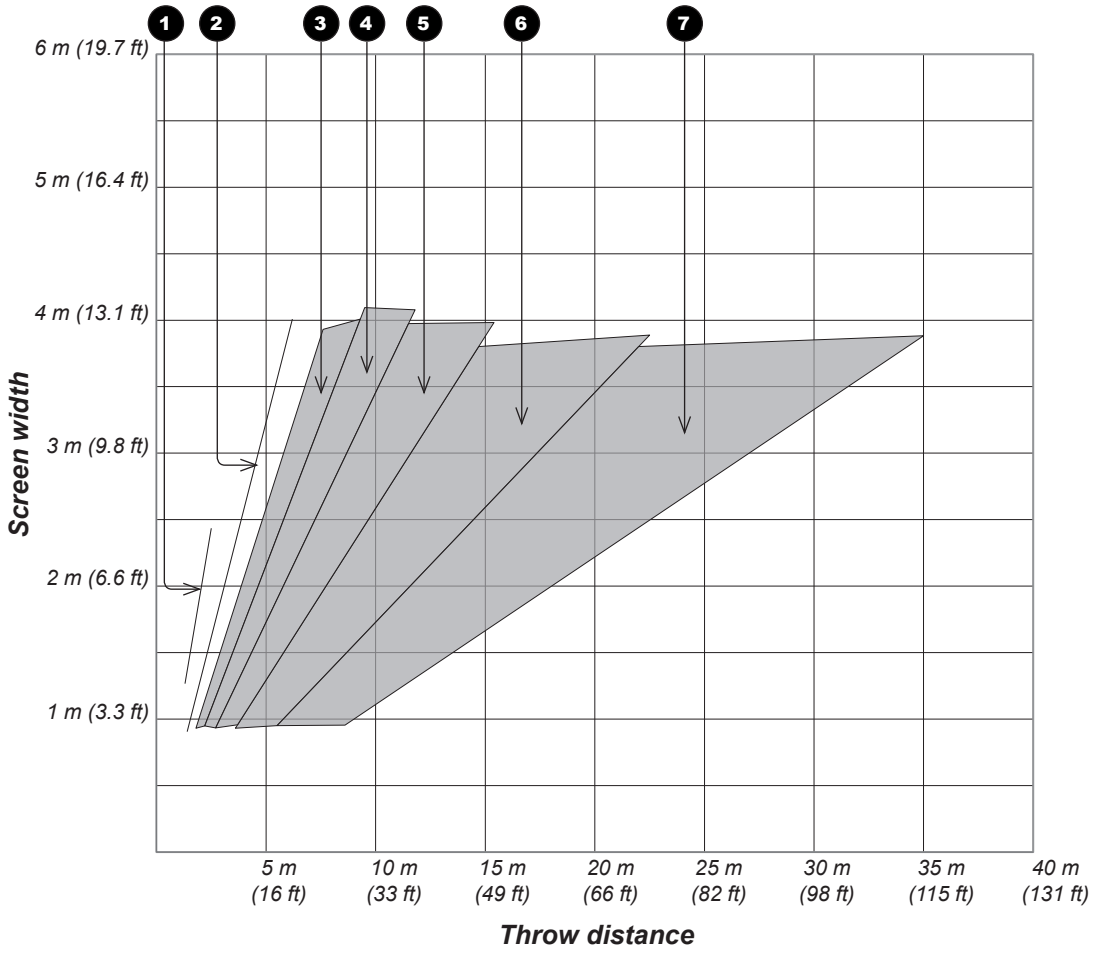
This chart has a throw ratio factor of 1.42, for use with the following images:



For information about individual lens part numbers, see ***Appendix A*** *at the end of this document.*

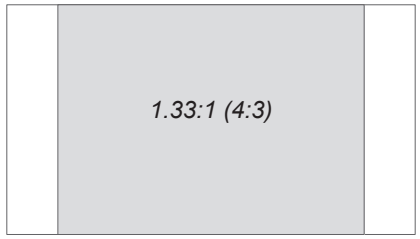
DMD™ resolution 1080p, 1.33:1 images

1. **0.77 : 1 fixed lens**
2. **1.16 : 1 fixed lens**
3. **1.45 - 1.74 : 1 zoom lens**
4. **1.74 - 2.17 : 1 zoom lens**
5. **2.17 - 2.90 : 1 zoom lens**
6. **2.90 - 4.34 : 1 zoom lens**
7. **4.34 - 6.76 : 1 zoom lens**



Notes

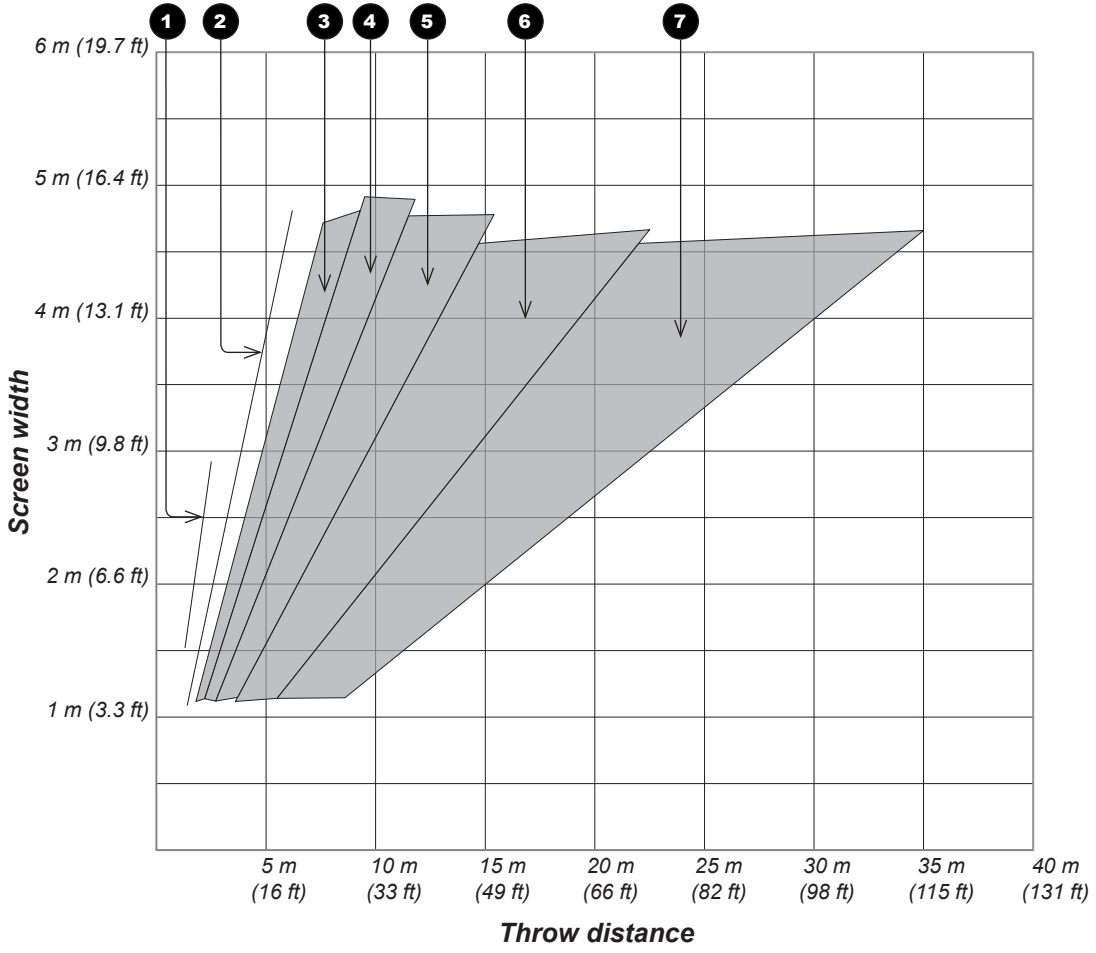
This chart has a throw ratio factor of 1.33, for use with the following images:



For information about individual lens part numbers, see ***Appendix A*** *at the end of this document.*

DMD™ resolution 1080p, 1.6:1 images

1. **0.77 : 1 fixed lens**
2. **1.16 : 1 fixed lens**
3. **1.45 - 1.74 : 1 zoom lens**
4. **1.74 - 2.17 : 1 zoom lens**
5. **2.17 - 2.90 : 1 zoom lens**
6. **2.90 - 4.34 : 1 zoom lens**
7. **4.34 - 6.76 : 1 zoom lens**



Notes

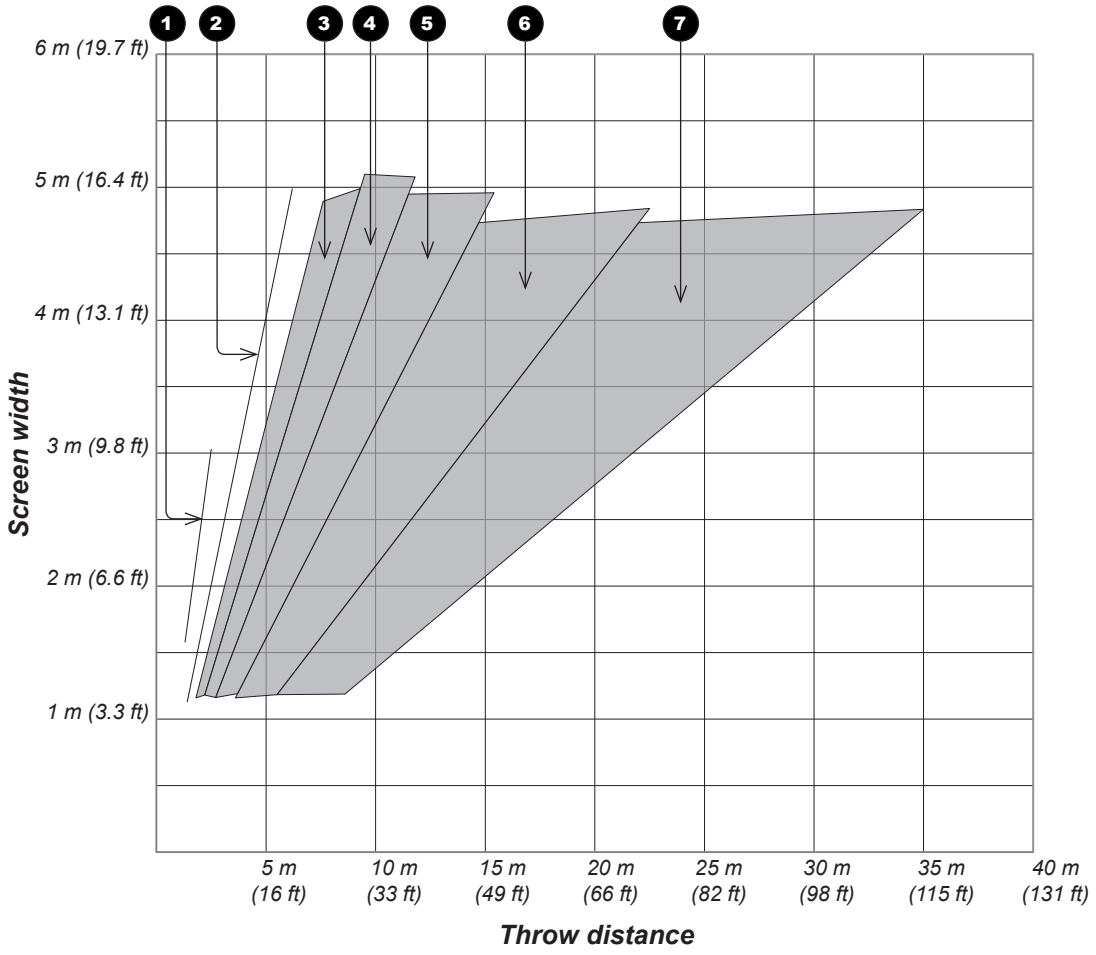
This chart has a throw ratio factor of 1.11, for use with the following images:

1.6:1 (16:10)

For information about individual lens part numbers, see ***Appendix A*** *at the end of this document.*

DMD™ resolution 1080p, 1.66:1 images

1. **0.77 : 1 fixed lens**
2. **1.16 : 1 fixed lens**
3. **1.45 - 1.74 : 1 zoom lens**
4. **1.74 - 2.17 : 1 zoom lens**
5. **2.17 - 2.90 : 1 zoom lens**
6. **2.90 - 4.34 : 1 zoom lens**
7. **4.34 - 6.76 : 1 zoom lens**



Notes

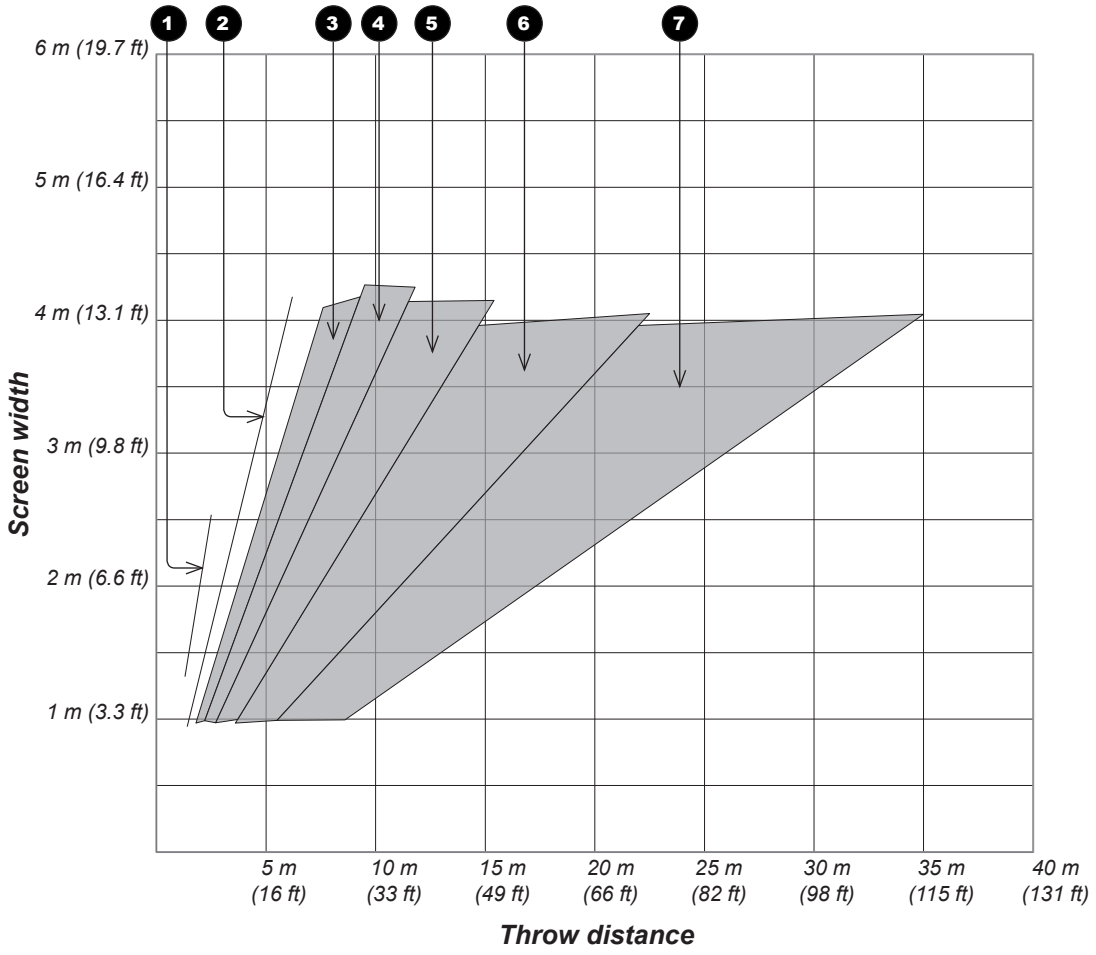
This chart has a throw ratio factor of 1.07, for use with the following images:

1.66:1 (Vista)

For information about individual lens part numbers, see ***Appendix A*** *at the end of this document.*

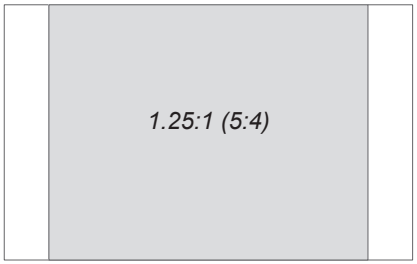
DMD™ resolution WUXGA, 1.25:1 images

1. **0.77 : 1 fixed lens**
2. **1.16 : 1 fixed lens**
3. **1.45 - 1.74 : 1 zoom lens**
4. **1.74 - 2.17 : 1 zoom lens**
5. **2.17 - 2.90 : 1 zoom lens**
6. **2.90 - 4.34 : 1 zoom lens**
7. **4.34 - 6.76 : 1 zoom lens**



Notes

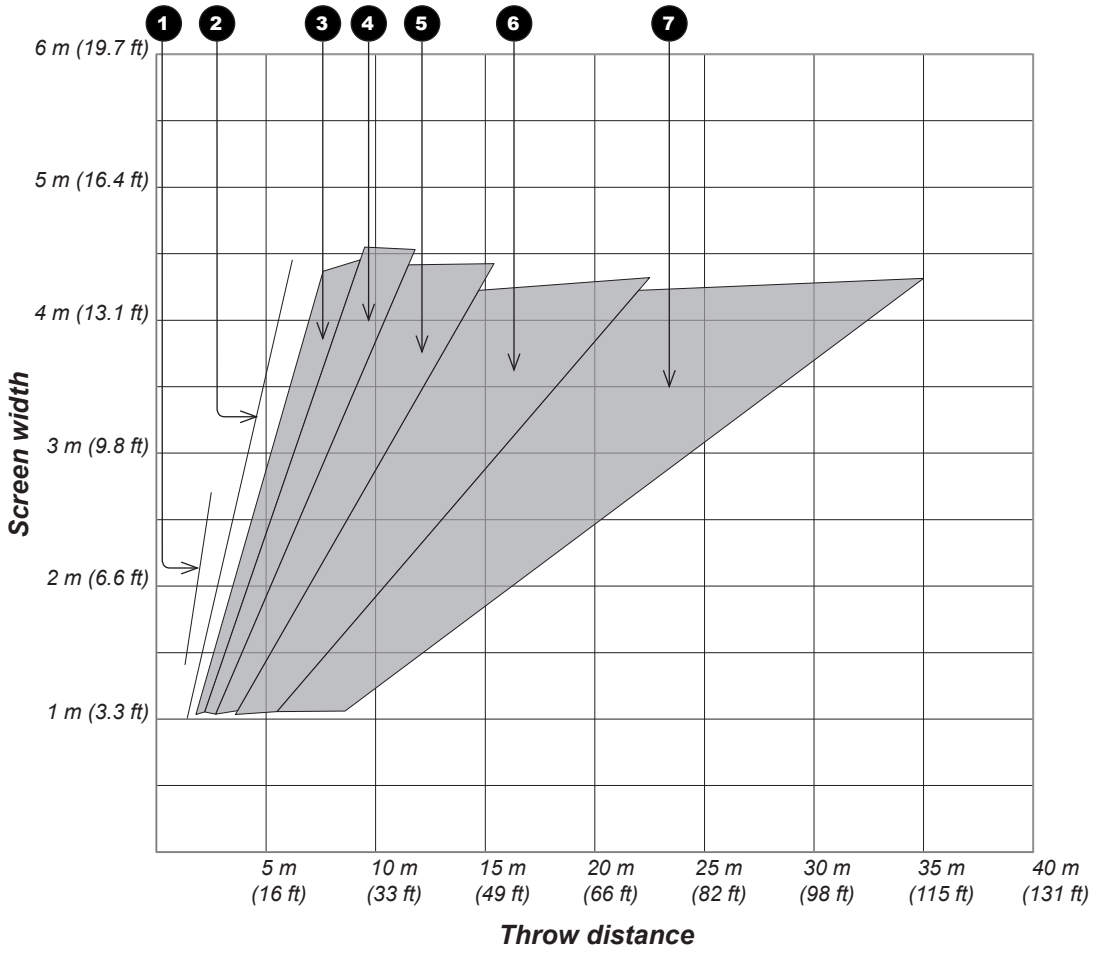
This chart has a throw ratio factor of 1.28, for use with the following images:



For information about individual lens part numbers, see ***Appendix A*** *at the end of this document.*

DMD™ resolution WUXGA, 1.33:1 images

1. **0.77 : 1 fixed lens**
2. **1.16 : 1 fixed lens**
3. **1.45 - 1.74 : 1 zoom lens**
4. **1.74 - 2.17 : 1 zoom lens**
5. **2.17 - 2.90 : 1 zoom lens**
6. **2.90 - 4.34 : 1 zoom lens**
7. **4.34 - 6.76 : 1 zoom lens**



Notes

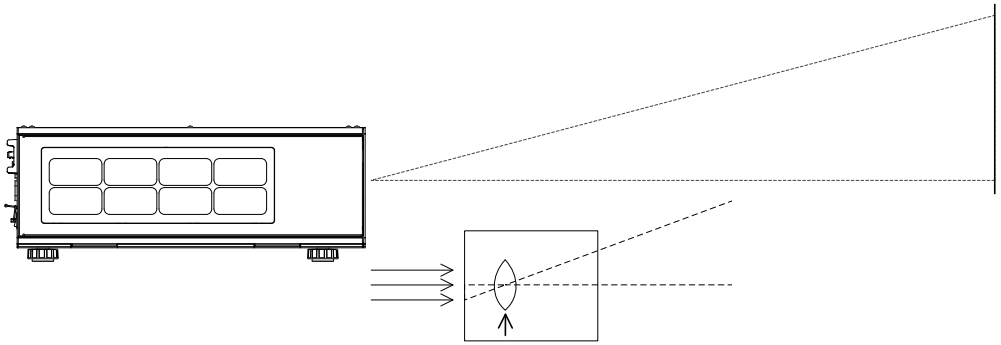
This chart has a throw ratio factor of 1.2, for use with the following images:

1.33:1 (4:3)

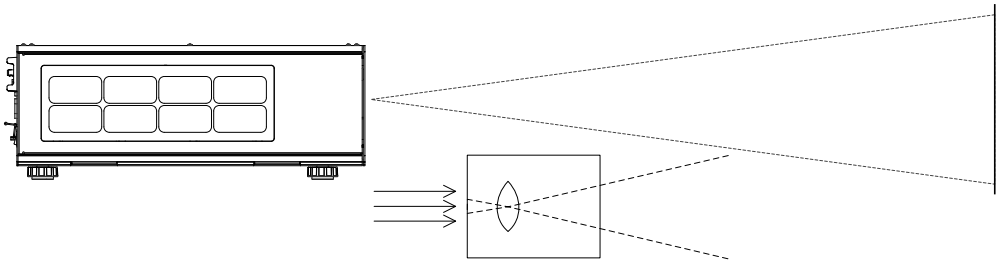
*For information about individual lens part numbers, see **Appendix A** at the end of this document.*

Positioning The Image

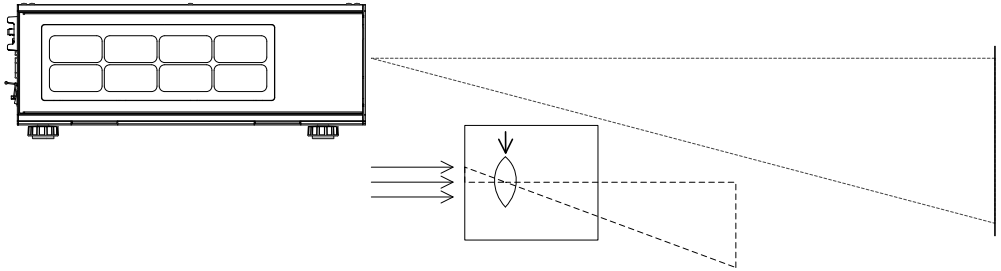
The normal position for the projector is at the centre of the screen. However, you can set the projector above or below the centre, or to one side, and adjust the image using the **Lens shift** feature (known as ***rising and falling front***) to maintain a geometrically correct image.



Shifting the lens up (rising front)



Centered lens



Shifting the lens down (falling front)

Notes

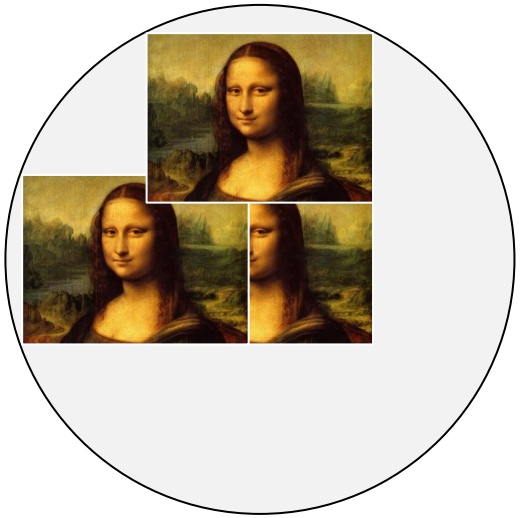
For more information on shifting the lens, see ***Lens Page*** *in* ***t****he* ***Operating Guide*** *and* ***Adjusting the lens*** *in the* ***Installation and Quick-Start Guide****.*

Whenever possible, position the projector so that the lens is centered for the highest quality image.

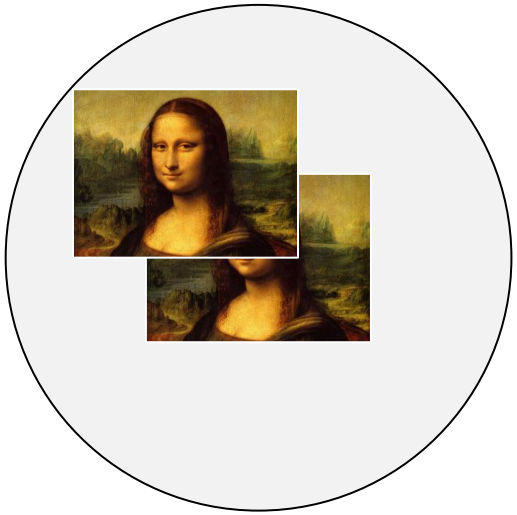
Positioning The Image (continued)

Any single adjustment outside the ranges specified on the following page may result in an unacceptable level of distortion, particularly at the corners of the image, due to the image passing through the periphery of the lens optics.

If the lens is to be shifted in two directions combined, the maximum range without distortion will be somewhat less, as can be seen in the illustrations below.



Full horizontal or vertical shift



Combined shift is reduced

Notes

*For more information on shifting the lens, see **Lens Page** in **t**he **Operating Guide** and **Adjusting the lens** in the **Installation and Quick-Start Guide**.*

Maximum offset range

The maximum offset range available with no distortion or vignetting is dependent on which lens is used. Shifting the lens beyond its undistorted limits may be physically possible, however you may experience some vignetting or distortion.

HIGHlite 8000 WUXGA	vertical (pixels)	horizontal (pixels)	vertical (frame)	horizontal (frame)
0.77 : 1 and 1.16:1 fixed lens	±240	±96	±0.2	±0.05
all zoom lens	±720	±288	±0.6	±0.15

HIGHlite 8000 1080p	vertical (pixels)	horizontal (pixels)	vertical (frames)	horizontal (frames)
0.77 : 1 fixed lens	±216	±96	±0.375	±0.05
1.16:1 fixed lens	±216	±96	±0.2	±0.05
all zoom lens	±648	±288	±0.6	±0.15

Notes

*For more information on shifting the lens, see **Lens Page** in **t**he **Operating Guide** and **Adjusting the lens** in the **Installation and Quick-Start Guide**.*

Input Connections

Single link HDMI-compatible DVI-D

- Sources up to:
  - 1080p projector — 1920x1080 resolution
  - WUXGA projector — 1920x1200 resolution;
- 24-60Hz vertical refresh;
- Deep color up to 12 bits supported;
- HDCP supported.

Notes

There is no scaler on the input.

Images up to and including the native resolution of the display will be displayed pixel for pixel and centered.

EDID on the DVI input

If you are using a computer DVI card or another source that obeys the EDID protocol, the source will automatically configure itself to suit the projector.

Otherwise please refer to the documentation supplied with the source to manually set the resolution to the DMD™ resolution of the projector or the nearest suitable setting. Switch off the source, connect to the projector, then switch the source back on again.

Using HDMI/DVI switchers with the projector

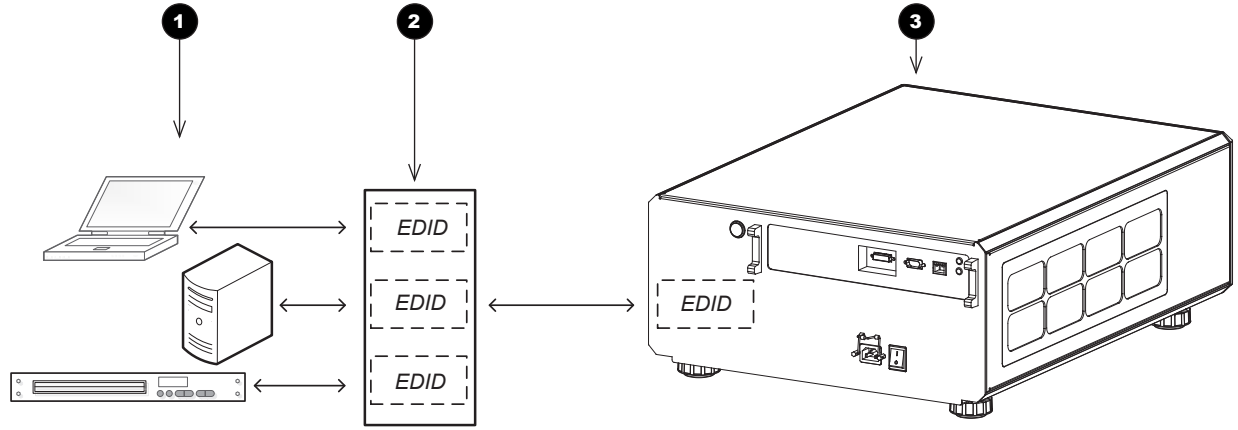
When using an HDMI/DVI source switcher with the projector, it is important to set the switcher so that it passes the projector EDID through to the source devices. If this is not done, the projector may not be able to lock to the source or display the source correctly as its video output timings may not be compatible with those of the projector. Sometimes this is called transparent, pass-through or clone mode. Please see your switcher's manual for information on how to set this mode.

Additionally, sources which use HDCP encryption may not display properly when connected to the projector via a switcher. Refer to the switcher's manual for more information.

1 **Sources**

2 **Switcher**

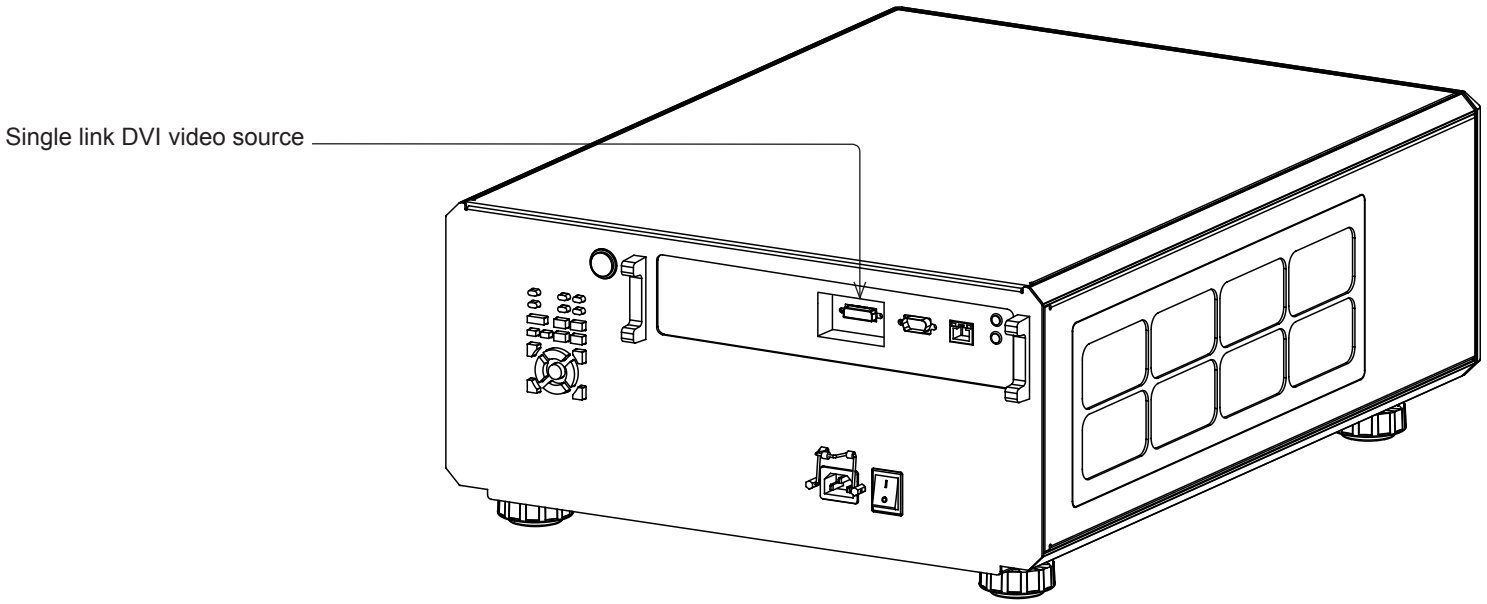
3 **Projector**



The EDIDs in the switcher should be the same as the one in the projector.

Notes

Connection example

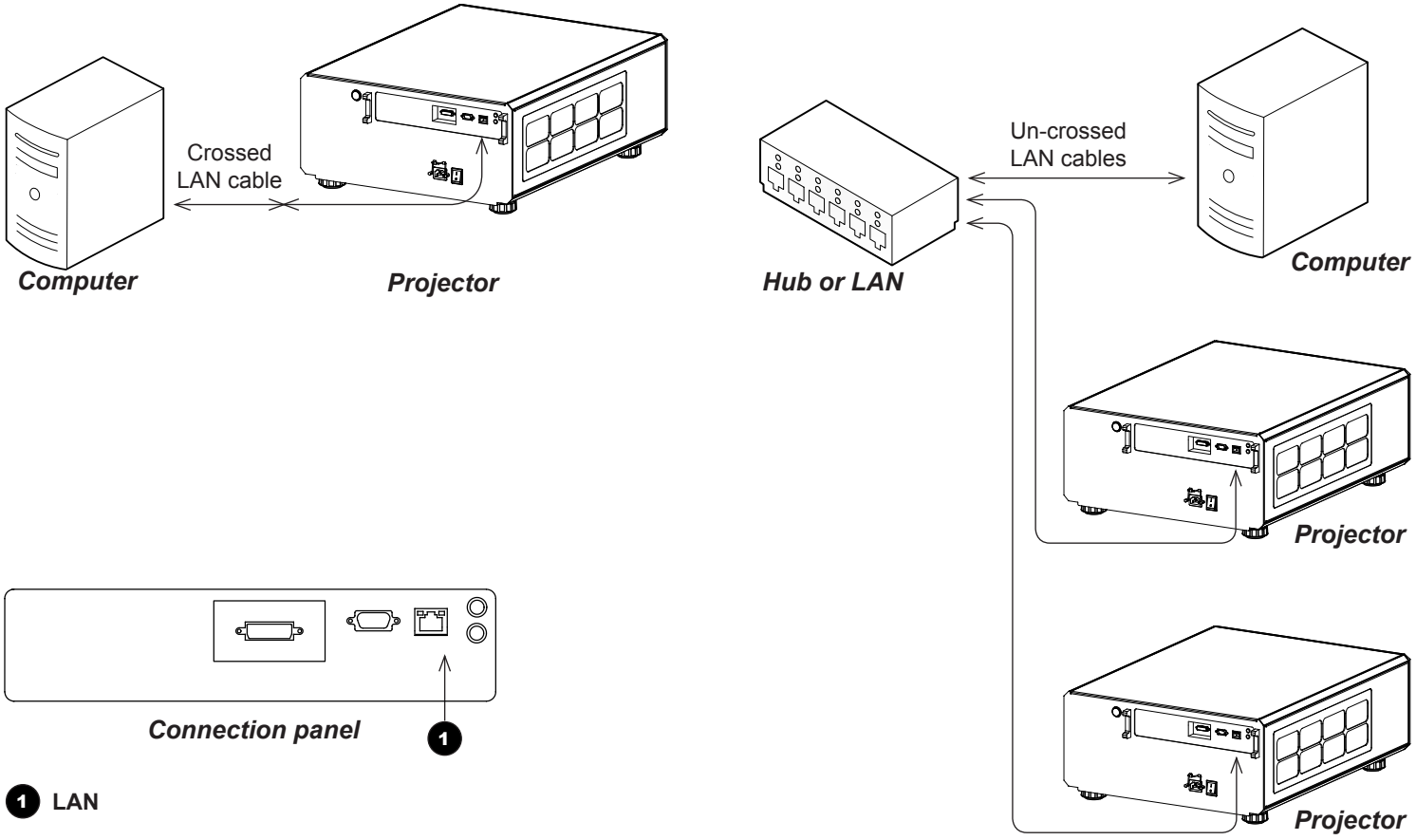


Notes

Control Connections

LAN connection

The projector's features can be controlled via a LAN connection, using a standard internet browser package.

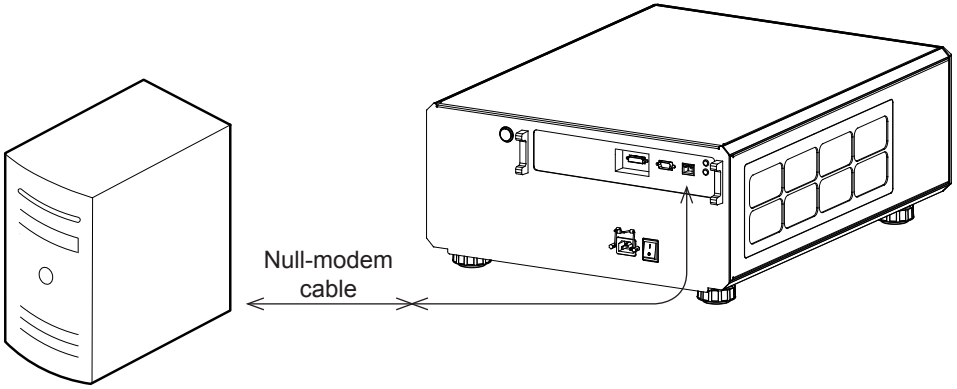


1 **LAN**

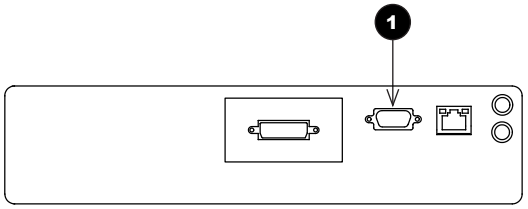
Notes

*For further information on using a network connection to control the projector, see the **Operating Guide** and the **Protocol Guide**.*

RS232 connection



Computer ***Projector***



Connection panel

1 **RS232**

Notes

Appendix A: Lens Part Numbers

Throw ratios	Part number	Throw distance range
0.77 : 1 fixed lens	110-808	1.3 - 2.5 m (4.3 - 8.2 ft)
1.16 : 1 fixed lens	110-809	1.4 - 6.2 m (4.6 - 20.3 ft)
1.45 - 1.74 : 1 zoom lens	110-803	1.8 - 9.3 m (5.9 - 30.5 ft)
1.74 - 2.17 : 1 zoom lens	110-804	2.2 - 11.8 m (7.2 - 38.7 ft)
2.17 - 2.90 : 1 zoom lens	110-805	2.7 - 15.4 m (8.9 - 50.5 ft)
2.90 - 4.34 : 1 zoom lens	110-806	3.6 - 22.5 m (11.8 - 73.8 ft)
4.34 - 6.76 : 1 zoom lens	110-807	5.5 - 35 m (18 - 115 ft)

Notes

The Throw ratio for a particular lens is fixed, but assumes that the image fills the width of the DMD.

For images that do not fill the width of the DMD, the throw ratio is effectively increased. To correct for this in these calculations, a throw ratio factor is used.

Throw distance calculations are based on the distance from the outer end of the lens, which will vary from lens to lens.

Appendix B: Supported Signal Input Modes

Standard		Resolution	Vertical Frequency (Hz)	Total number of lines	Horizontal Frequency (kHz)
EDTV	480p59	720 x 480	59.94	525	31.47
	480p60	720 x 480	60.00	525	31.50
	576p50	720 x 576	50.00	625	31.25
HDTV	720p50	1280 x 720	50.00	750	37.50
	720p59	1280 x 720	59.94	750	44.96
	720p60	1280 x 720	60.00	750	45.00
	1080p23	1920 x 1080	23.98	1125	26.97
	1080p24	1920 x 1080	24.00	1125	27.00
	1080p25	1920 x 1080	25.00	1125	28.13
	1080p29	1920 x 1080	29.97	1125	33.72
	1080p30	1920 x 1080	30.00	1125	33.75
	1080p50	1920 x 1080	50.00	1125	56.25
	1080p59	1920 x 1080	59.94	1125	67.43
	1080p60	1920 x 1080	60.00	1125	67.50

Notes

Interlaced video formats are not supported.

The projector supports standards smaller than or equal to its native resolution.

There is no scaler on the input.

Images up to and including the native resolution of the display will be displayed pixel for pixel and centered..

Standard		Resolution	Vertical Frequency (Hz)	Total number of lines	Horizontal Frequency (kHz)
COMPUTER	VGA59	640 x 480	59.94	525	31.47
	VGA60	640 x 480	60.00	525	31.50
	MACI	640 x 480	66.67	525	35.00
	VGA72	640 x 480	72.81	520	37.86
	VGA75	640 x 480	75.00	500	37.50
	DOS70	720 x 400	70.09	449	31.47
	SVGA50	800 x 600	49.92	621	31.00
	SVGA56	800 x 600	56.25	625	35.16
	SVGA60	800 x 600	60.32	628	37.88
	SVGA72	800 x 600	72.19	666	48.08
	SVGA75	800 x 600	75.00	625	46.88
	MACII	832 x 624	75.08	1120	49.10
	XGA50	1024 x 768	49.98	793	39.63
	XGA60	1024 x 768	60.00	806	48.36
	XGA70	1024 x 768	70.07	806	56.48
	XGA75	1024 x 768	75.03	800	60.02
	XGA+70	1152 x 864	70.01	912	63.85
	XGA+75	1152 x 864	75.00	900	67.50
	MAC2	1152 x 870	75.06	915	68.68
	SUN1166	1152 x 900	66.00	937	61.85
	WXGA50	1280 x 720	49.83	744	37.07
	WXGA60	1280 x 720	59.86	748	44.77
	WXGA50	1280 x 768	49.92	793	39.59
	WXGA60	1280 x 768	59.87	798	47.78
	SXGA-60	1280 x 960	60.00	1000	60.00
	SXGA50	1280 x 1024	49.84	1057	52.68
	SXGA60	1280 x 1024	60.02	1066	63.98

Notes

The projector supports standards smaller than or equal to its native resolution.

There is no scaler on the input.

Images up to and including the native resolution of the display will be displayed pixel for pixel and centered.

Standard		Resolution	Vertical Frequency (Hz)	Total number of lines	Horizontal Frequency (kHz)
COMPUTER continued	SXGA75	1280 x 1024	75.02	1066	79.98
	HD50	1360 x 768	49.89	793	39.56
	HD60	1360 x 768	59.80	798	44.72
	SXGA+50	1400 x 1050	49.97	1083	54.12
	SXGA+60	1400 x 1050	59.98	1089	65.32
	WSXGA50	1536 x 960	49.93	991	49.48
	WSXGA60	1536 x 960	59.91	996	59.67
	UXGA50	1600 x 1200	49.92	1238	61.78
	UXGA60	1600 x 1200	60.00	1250	75.00
	WSXGA+60	1680 x 1050	59.95	1089	65.29
	FHD50	1920 x 1080	49.92	1114	55.62
	FHD60	1920 x 1080	59.93	1125	66.59
	WUXGA50	1920 x 1200	49.93	1238	61.81
	WUXGA60	1920 x 1200	59.95	1235	74.04

Notes

The projector supports standards smaller than or equal to its native resolution. The WUXGA50 and WUXGA60 standards are supported by WUXGA projectors only.

There is no scaler on the input.

Images up to and including the native resolution of the display will be displayed pixel for pixel and centered.

Appendix C: Glossary Of Terms

Notes

1080p

An ***HDTV resolution*** which corresponds to 1920 x 1080 pixels (a widescreen ***aspect ratio*** of 16:9).

Anamorphic lens

A special lens which, when used with the ***TheaterScope aspect ratio***, allows watching 2.35:1 content packed in a 16:9 source.

Aspect ratio

The proportional relationship between the width and the height of the projected image. It is represented by two numbers separated by a colon, indicating the ratio of image width and height respectively: for example, 16:9 or 2.35:1.

Not to be confused with ***resolution***.

Blanking (projection)

The ability to intentionally turn off, that is, set to black, areas around the edges of the projected image. It is sometimes referred to as “curtains” since it can be used to blank an area of image that literally falls on the curtains at the side of the screen in a movie theater. Usually no image resizing or geometric correction takes place and the “blanked” part of the image is lost.

Not to be confused with horizontal and vertical ***blanking (video signal)***.

Blanking (video signal)

The section of the video signal where there is no active video data.

Not to be confused with ***blanking (projection)***.

Brightness (electronic control)

A control which adds a fixed intensity value to every pixel in the display, moving the entire range of displayed intensities up or down, and is used to set the black point in the image (see ***Contrast***).

Brightness (optical)

Describes how 'bright' an image that is projected onto a screen appears to an observer.

Cold mirror

A mirror that preferentially reflects or transmits infra-red light. In a projector, a cold mirror is used to reflect the visible component of the lamp beam into the illumination optics and transmit the unwanted infrared radiation into an absorber.

Color gamut

The spectrum of color available to be displayed.

Color temperature

The position along the black body curve on the chromaticity diagram, normally quoted in Kelvin. It takes into account the preset values for color balance in the service set-up to take up the variations in the prism. The projector allows you to adjust this temperature (i.e. adjust the picture color temperature).

ColorMax

A method of accurately color-matching projectors together.

Contrast (electronic control)

The adjustment of the white point of the image without affecting the black point. This increases the intensity range of the displayed image.

Contrast (optical)

The intensity difference between the darkest and lightest areas of the screen.

Crop

Remove part of the projected image.

Alternatively, fit an image into a frame with a different ***aspect ratio*** by removing part of the image. The image is resized so that either its length or its width equals the length or width of the frame, while the other dimension has moved outside the frame; the excess area is then cut out.

Notes

DDC (Display Data Channel)

A communications link between the source and projector. DDC is used on the HDMI, DVI and VGA inputs. The link is used by the source to read the ***EDID*** stored in the projector.

DHCP (Dynamic Host Configuration Protocol)

A network protocol that is used to configure network devices so that they can communicate on an IP network, for example by allocating an IP address.

DMD™ (Digital Micromirror Device™)

The optical tool that transforms the electronic signal from the input source into an optical image projected on the screen. The DMD™ of a projector has a fixed ***resolution***, which affects the ***aspect ratio*** of the projected image.

A Digital Micromirror Device™ (DMD™) consists of moving microscopic mirrors. Each mirror, which acts as a pixel, is suspended between two posts by a thin torsion hinge. It can be tilted to produce either a bright or dark pixel.

EDID (Extended Display Identification Data)

Information stored in the projector that can be read by the source.

EDID is used on the HDMI, DVI and VGA inputs, allowing the source to automatically configure to the optimum display settings.

EDTV (Enhanced Definition Television)

A ***progressive*** digital television system with a lower resolution than ***HDTV***.

Frame rate multiplication

To stop low frame rate 3D images from flickering, frame rate multiplication can be used, which increases the displayed frame rate by two or three times.

Gamma

A nonlinear operation used to code and decode luminance. It originates from the Cathode Ray Tube technology used in legacy television sets.

Notes

HDCP (High-bandwidth Digital Content Protection)

An encryption scheme used to protect video content.

HDTV (High Definition Television)

A television system with a higher ***resolution*** than ***SDTV*** and ***EDTV***. It can be transmitted in various formats, notably ***1080p*** and 720p.

Hertz (Hz)

Cycles per second.

Horizontal Scan Rate

The rate at which the lines of the incoming signal are refreshed. The rate is set by the horizontal ***synchronization*** from the source and measured in ***Hertz***.

Hs + Vs

Horizontal and vertical ***synchronization***.

LED (Light Emitting Diode)

An electronic component that emits light.

Letterboxing

Black margins at the top and bottom of the image. Letterboxing appears when a wider image is packed into a narrower frame without changing the original ***aspect ratio***.

Lumen

A photometric unit of radiant power. For projectors, it is normally used to specify the total amount of emitted visible light.

Noise

Electrical interference displayed on the screen.

Notes

Pillarboxing

Black margins at the left and right of the image. Pillarboxing appears when a narrower image is packed into a wider frame without changing the ***aspect ratio***.

Progressive scanning

A method of updating the image in which the lines of each frame are drawn in a sequence.

Resolution

The number of pixels in an image, usually represented by the number of pixels per line and the number of lines (for example, 1920 x 1200).

Saturation

The amount of color in an image.

Scope

An ***aspect ratio*** of 2.35:1.

SDTV (Standard Definition Television)

A television system with a lower ***resolution*** than ***HDTV***.

SX+

A display ***resolution*** of 1400x1050 pixels with a 4:3 screen ***aspect ratio***. (Shortened from *SXGA+*, stands for *Super Extended Graphics Array Plus*.)

Synchronization

A timing signal used to coordinate an action.

TheaterScope

An ***aspect ratio*** used in conjunction with a special ***anamorphic lens*** to display 2.35:1 images packed into a 16:9 frame.

Notes

Throw distance

The distance between the screen and the projector.

Throw ratio

The ratio of the ***throw distance*** to the screen width.

TRC (Throw ratio correction)

A special number used in calculating ***throw distances*** and ***throw ratios*** when the image does not fill the width of the ***DMD™***.

TRC is the ratio of the DMD™ aspect ratio to the image source aspect ratio:

$$TRC = \frac{DMD™\ aspect\ ratio}{Source\ aspect\ ratio}$$

TRC is only used in calculations if it is greater than 1.

UXGA

A display ***resolution*** of 1600x1200 pixels with a 4:3 screen ***aspect ratio***. (Stands for *Ultra Extended Graphics Array*.)

Vertical Scan Rate

The rate at which the frames of the incoming signal are refreshed. The rate is set by the vertical ***synchronization*** from the source and measured in ***Hertz***.

Vignetting

Optical cropping of the image caused by the components in the projection lens. This can happen if too much offset is applied when positioning the image using the lens mount.

Vista

An ***aspect ratio*** of 1.66:1.

WUXGA

A display ***resolution*** of 1920 x 1200 pixels with a 16:10 screen ***aspect ratio***. (Stands for Widescreen *Ultra Extended Graphics Array*.)

Notes